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APRIL 1970

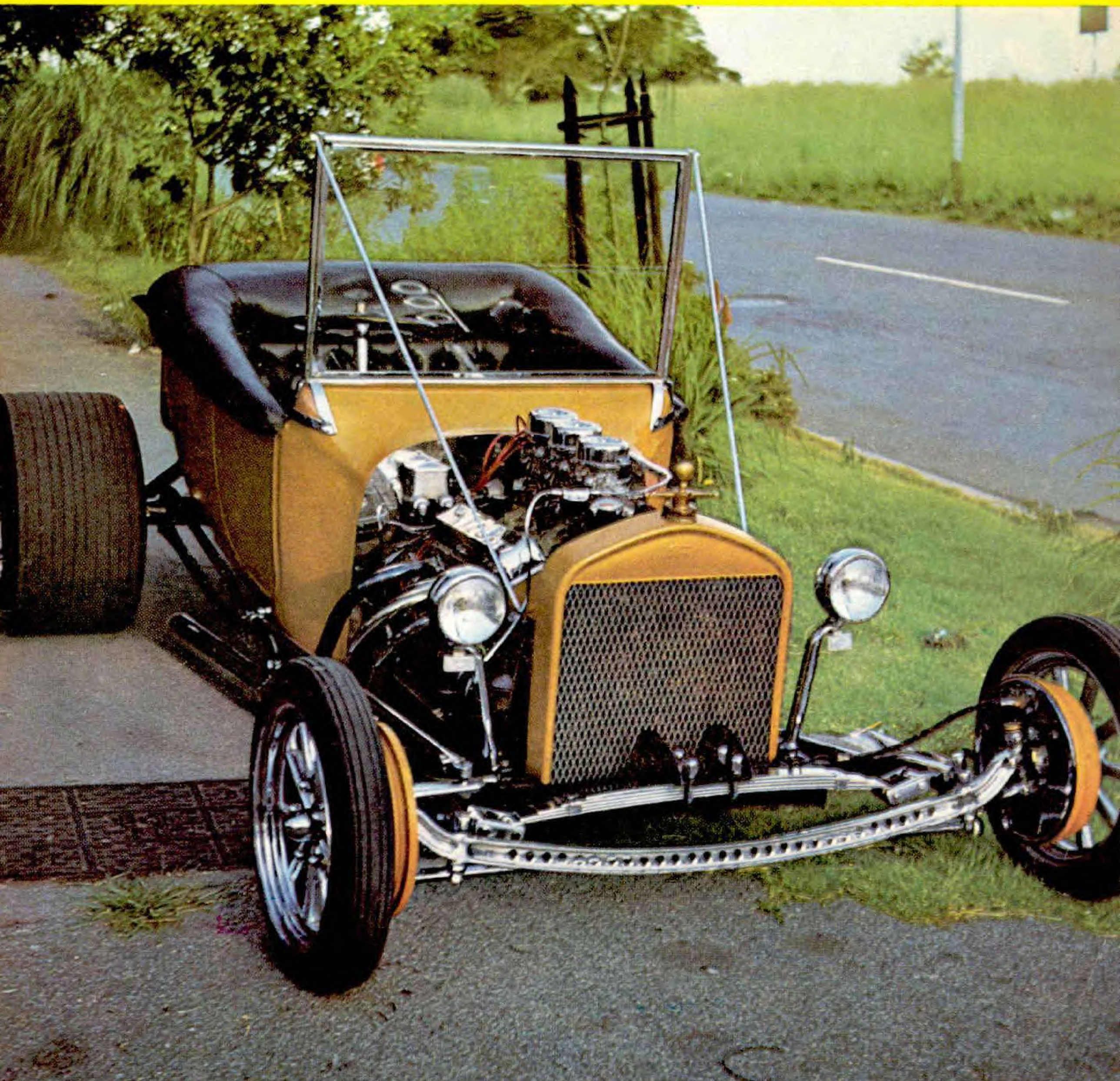
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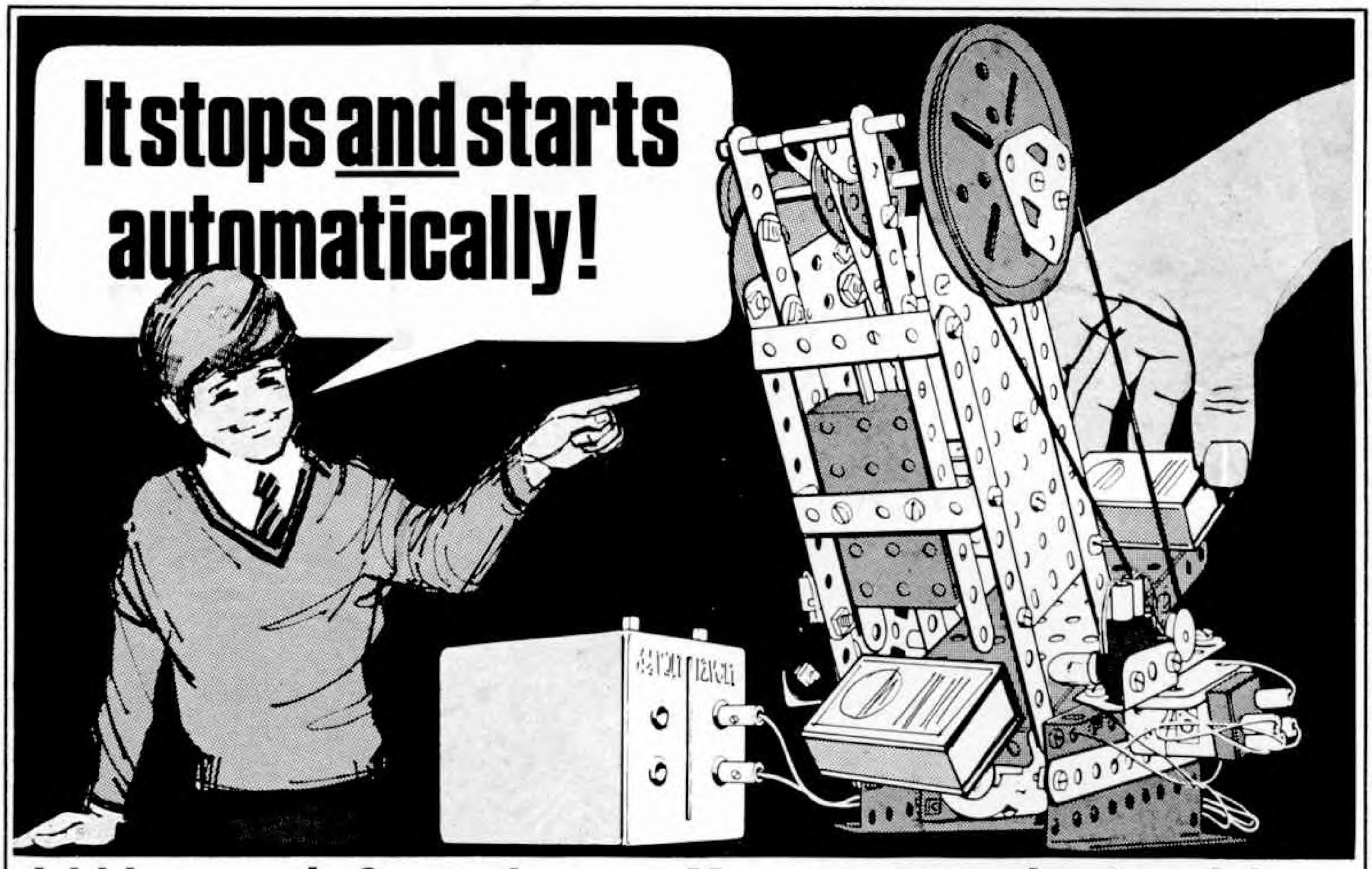
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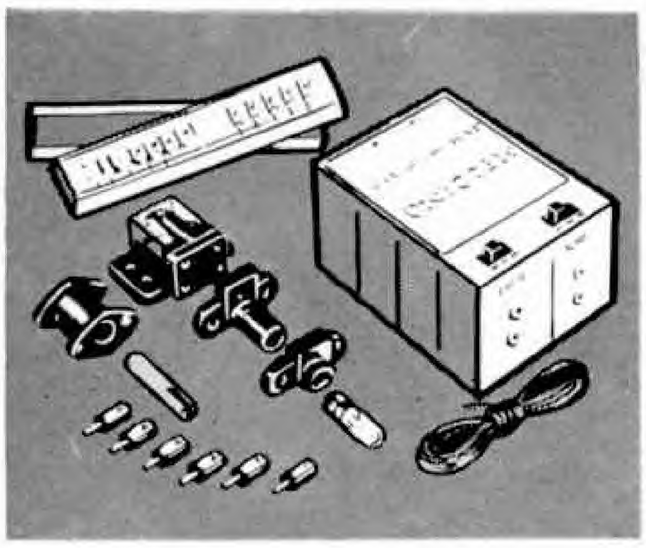
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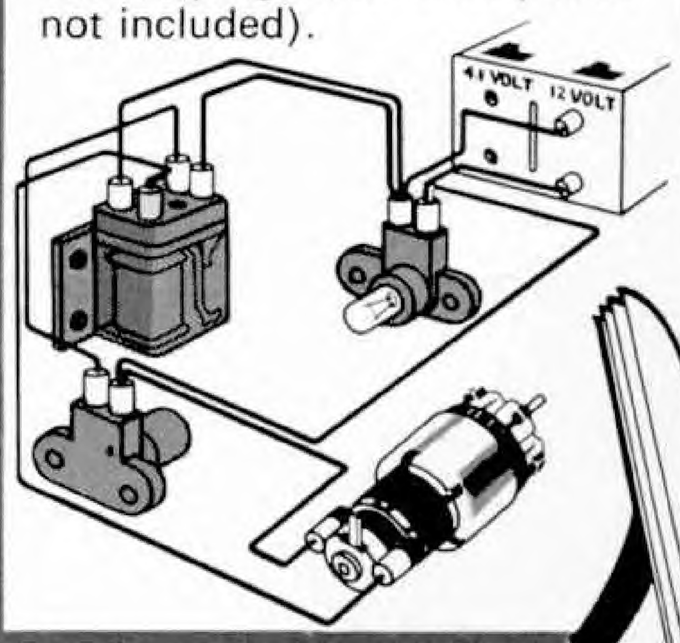
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APRIL 1970 VOLUME 55 NUMBER 4

Meccano Magazine, founded 1916.

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FRONT COVER

The head turning Hot-Rod on this month's cover vaguely resembles a "Model-T" Ford in looks, but has far better performance. Powered by a Chevrolet engine this beauty can reach speeds well in excess of 130 m.p.h.

Photographed in Johannesburgh, South Africa, by Alan Bolton.

NEXT MONTH

The *Cutty Sark*, possibly the most famous Tea Clipper of all time, was built at Dumbarton in 1869 and has therefore recently celebrated her 100th birthday (she now rests in dry dock at Greenwich).

Our May issue includes a feature on this beautiful ship, complete with numerous photographs taken during her long service.

Coming right up to date, Mike Rickett provides us with another feature on the American Apollo 12 moon landing, complete with numerous photographs, and tying in with the space theme, leading contributor, Trevor Holloway describes the world's largest crawler tractor, used to manoeuvre the Apollo Rocket to the launching pad.

Numerous other features including the story of Typewriters and the developments of Combine Harvesters plus the regular features on Meccano, stamps, Wargaming, etc., all add up to another varied and interesting issue.

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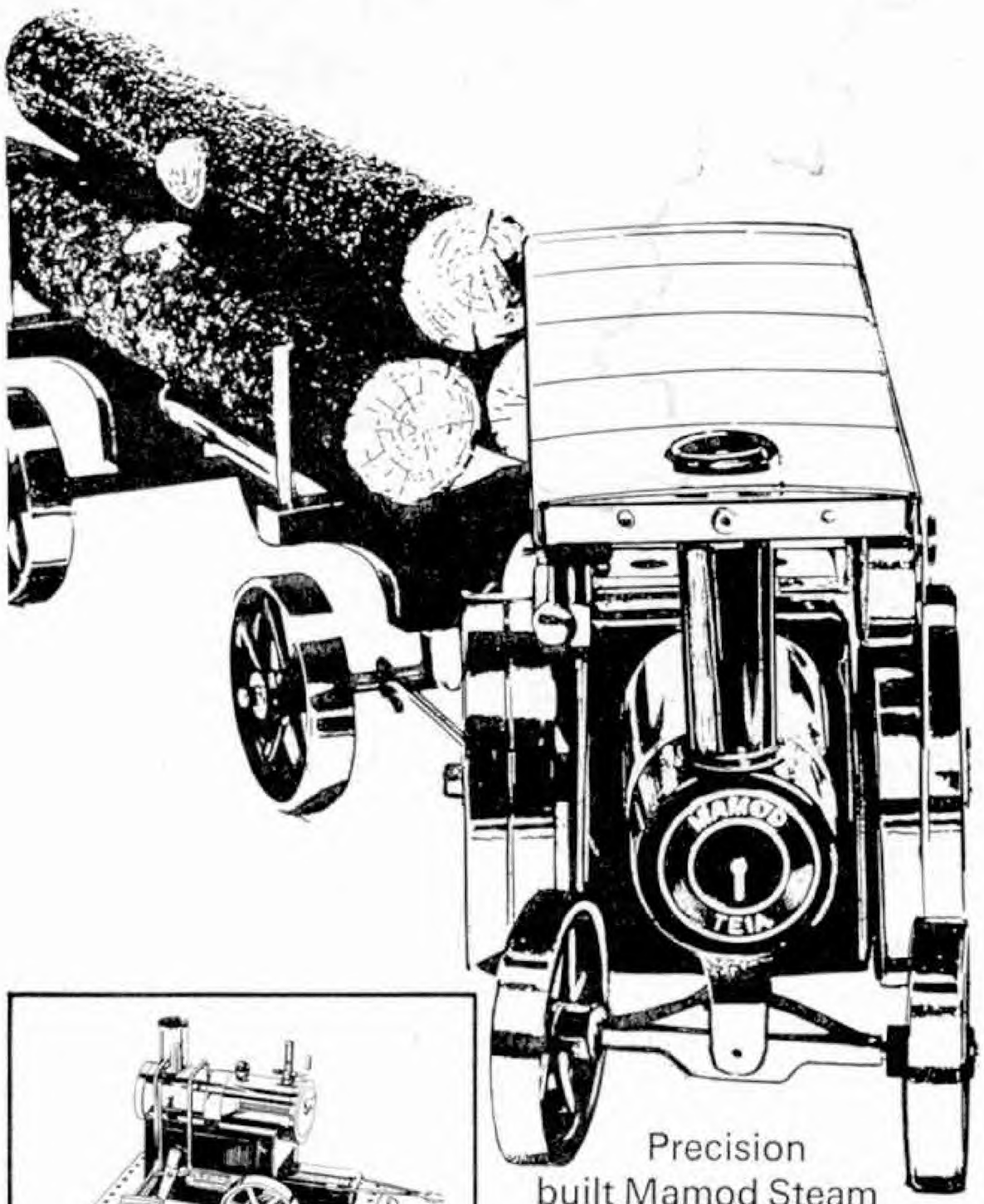
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A new " Supercar " from General Motors

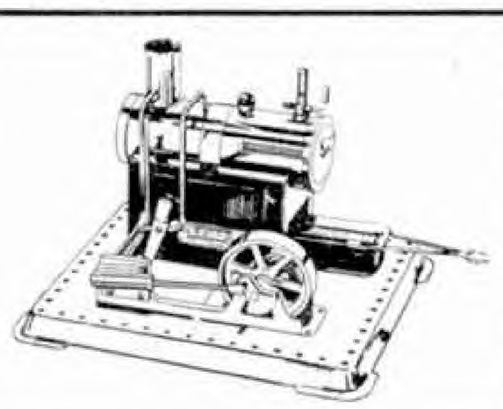
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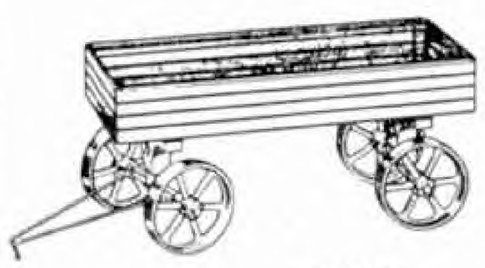
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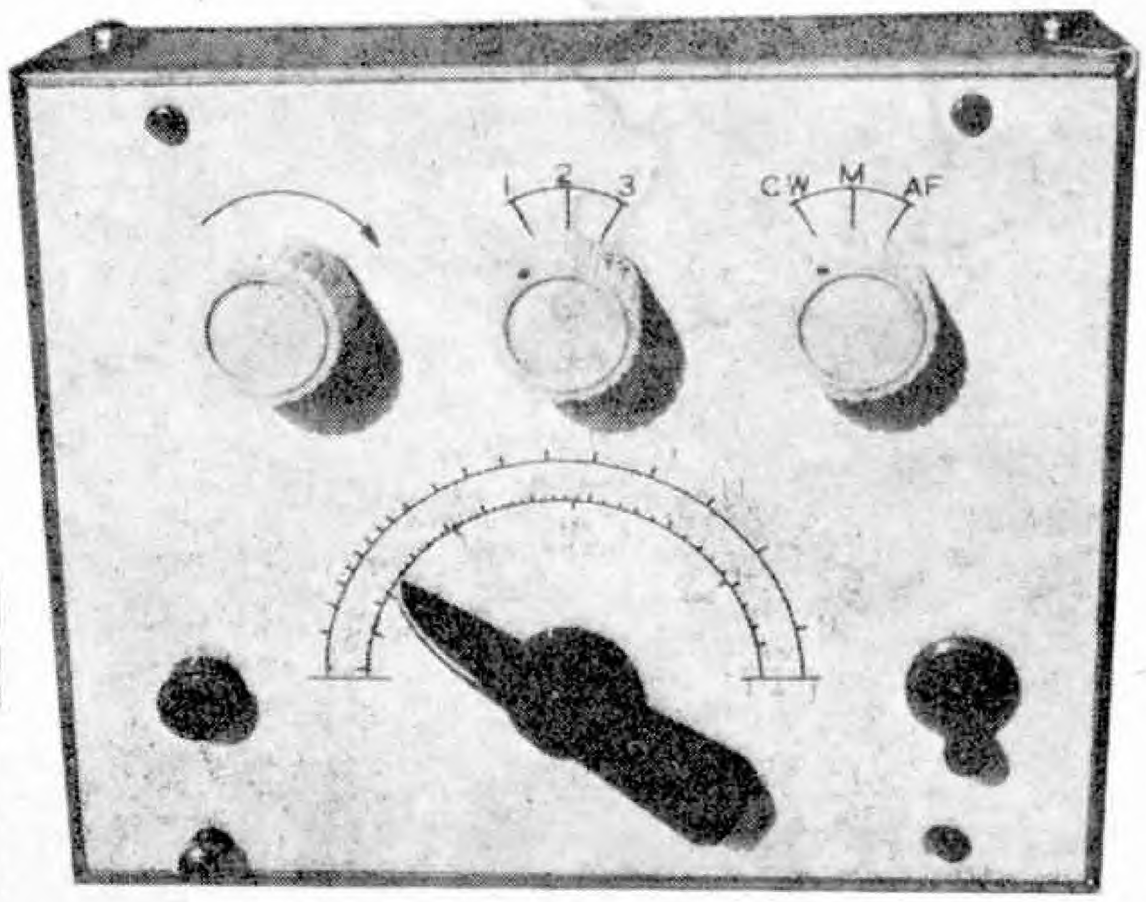
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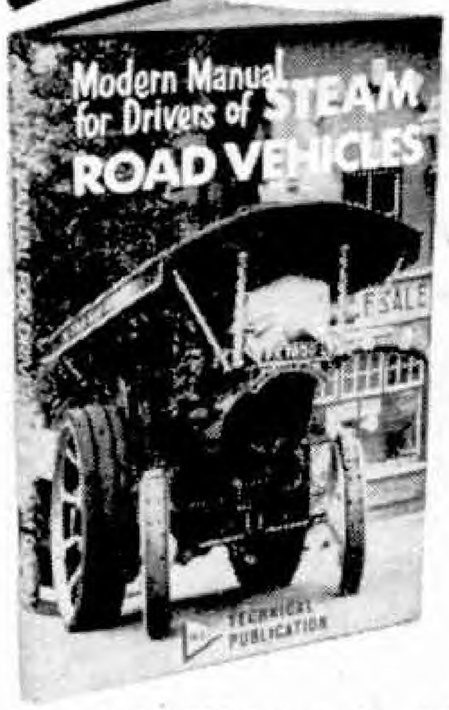
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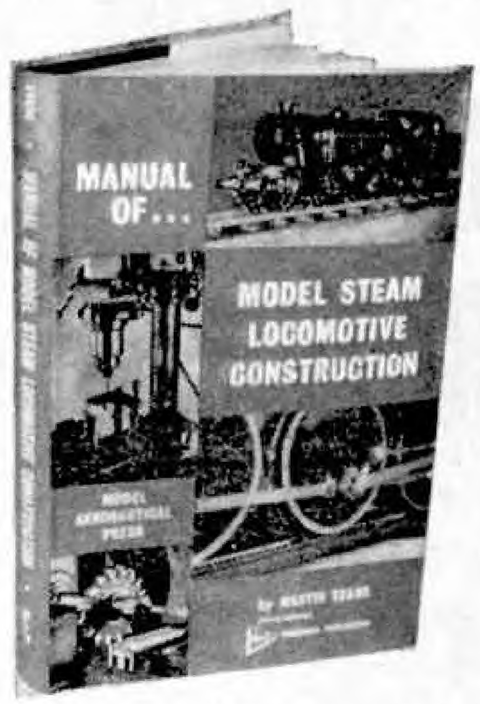


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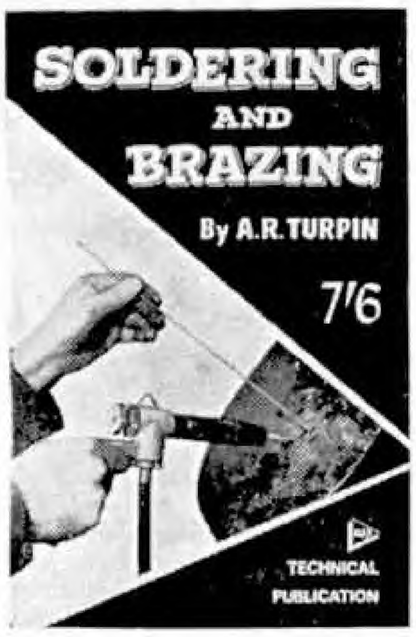


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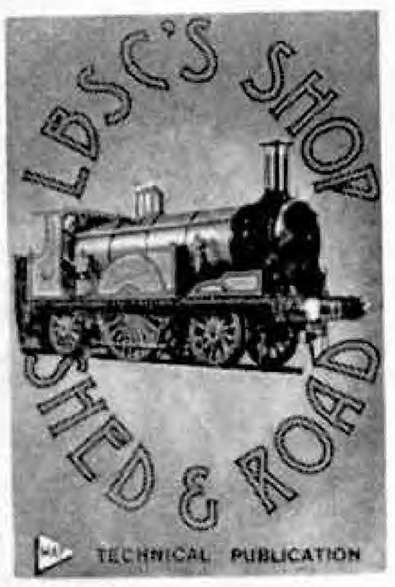
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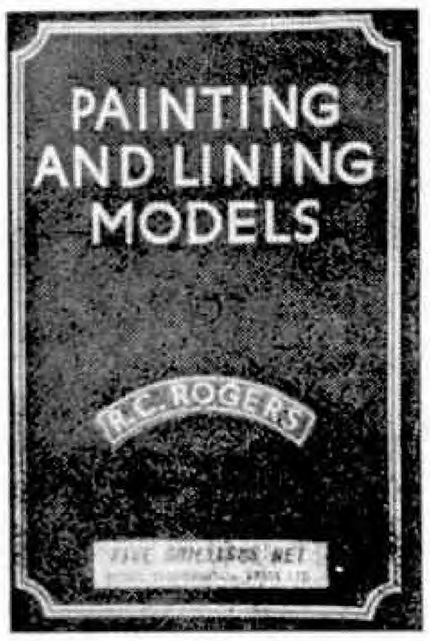
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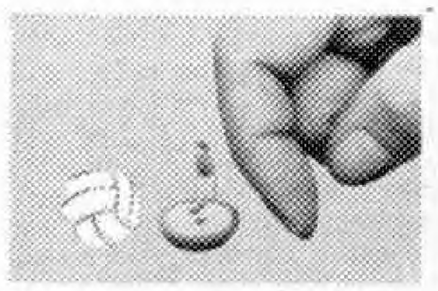
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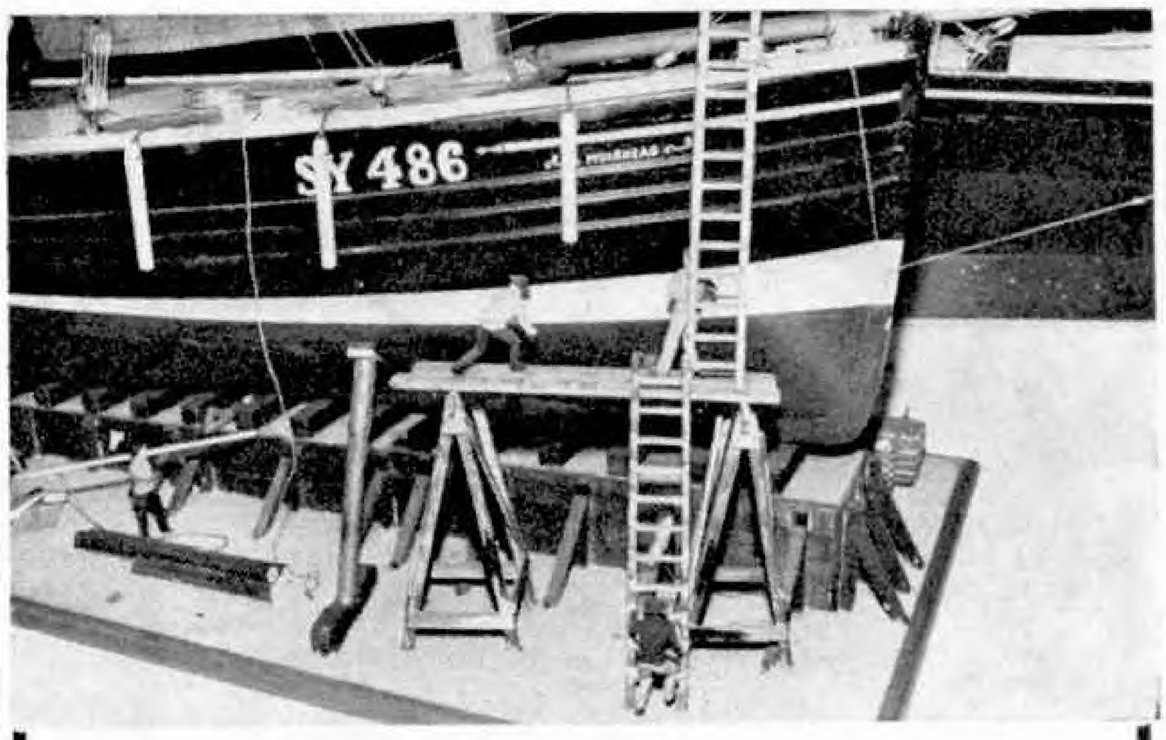
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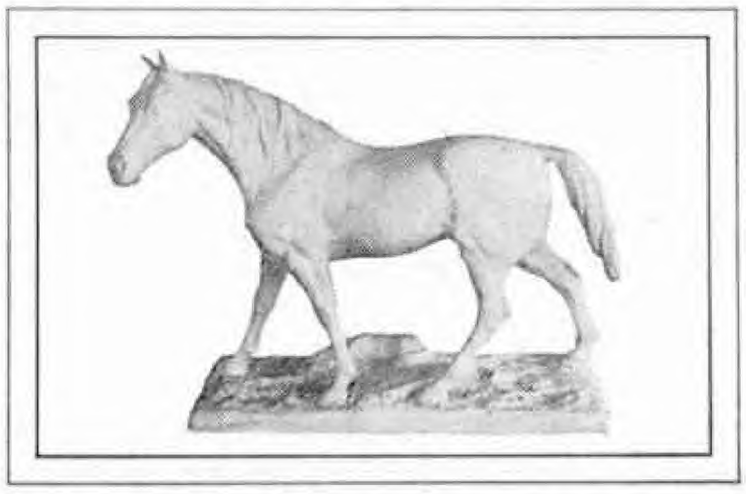
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ON THE EDITOR'S DESK

PHOTOGRAPHY COMPETITION

After a very successful run of ten months our photography competition is now closed. During the above period we have given away over £50 in prize money, and must confess that the consistently high standard of entries from readers made winner selection very difficult at times. Our judges have now selected the overall best entry, which goes to Mr. R. Clarke, of South Shields. Mr. Clarke's entry, under the "National Trust" section was published in Workbench in last September's issue. A cheque for £5 5s. is on its way to you Mr. Clarke. Congratulations!

DE-LUXE MOSQUITOS

I've been using Humbrol paints for years, as indeed probably most of you have, and during that time have used them for all sorts of objects, many not even remotely connected with modelling. Matching and touching-in chipped paintwork on my car and even recolouring a piece of torn wallpaper are a couple of "odd jobs" I've tackled with a Humbrol tinlet.

However, my efforts and ingenuity pale beside the latest efforts of the World Health Organisation in Burma, who are at present painting Mosquitos in yellow, red, white and green! The purpose of this very odd task is to enable scientists to easily identify and follow the movements of selected insects when carrying out their tests. What will they think of next!

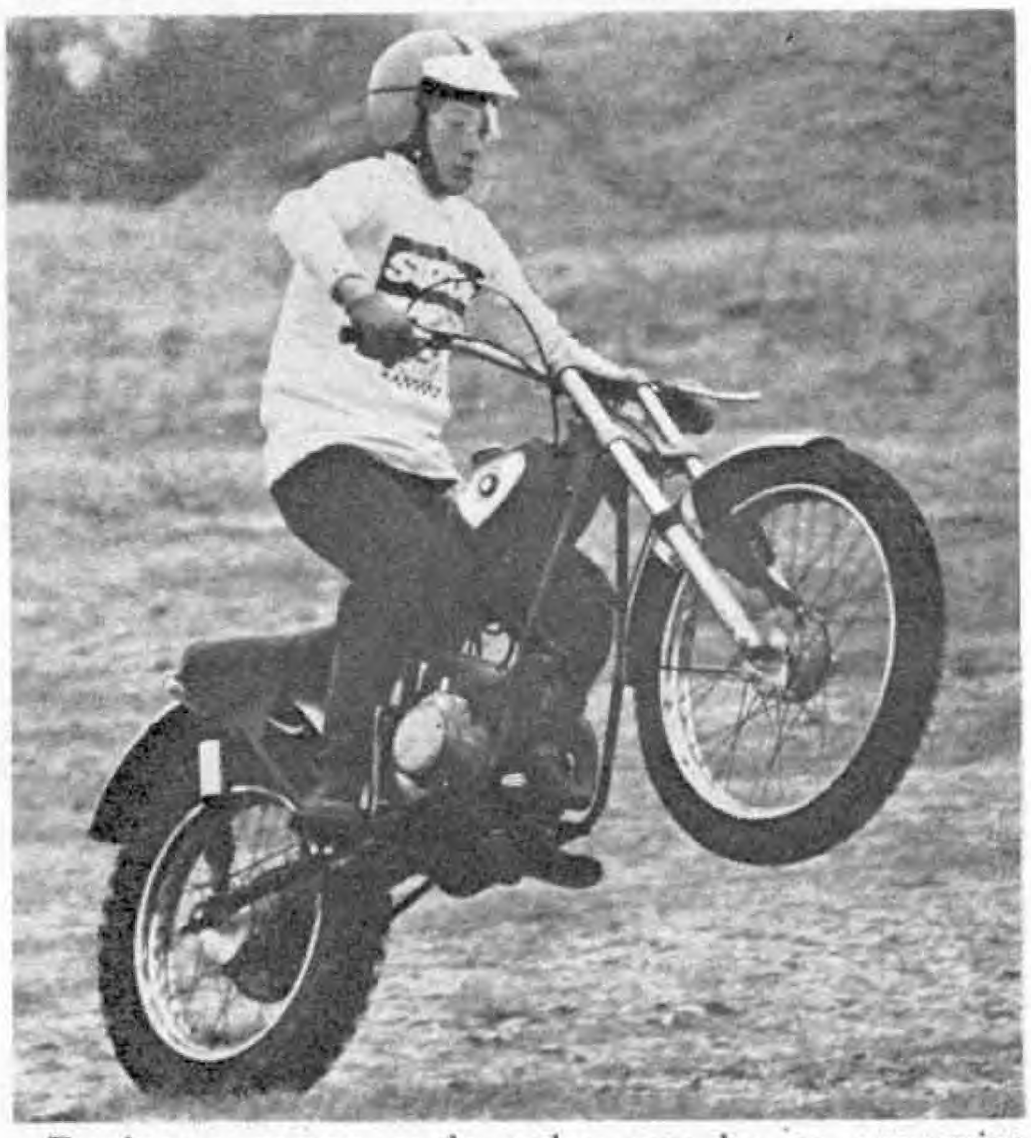
AIRFIX PRESENTATION



Three senior officers of R.A.F. Air Support Command, based at Lynham in Wiltshire, each received an authentic 1/72 scale model of the Lockheed C130K Hercules from Airfix Products Ltd., and the hand-over appropriately took place in front of aircraft number 196 on which the finely-detailed 16½ in. long model was based.

Our sample, recently received from Airfix will be reviewed in next month's "Have You Seen."

DO-IT-YOURSELF SCRAMBLER



Buying a motor cycle today can be an expensive business, mainly due to the fact that the Government slap a fairly large sum on top of the basic price in the form of Purchase Tax.

The only way to avoid paying this tax is to buy it in kit-form and spend a couple of evenings bolting everything together.

A Welsh company, Alta Motorcycles are producing in this way the "Schoolboy Scrambler" shown above being ridden by 13-year-old Keith White. Powered by a 100 cc's Suzuki engine tuned at the works to give extra power, this machine costs only £175, and is especially aimed at the younger rider.

If you are interested in learning more about this light-weight, drop a line to: Alta Motorcycles Ltd., John Player Trading Estate, Clydach, Glamorgan.

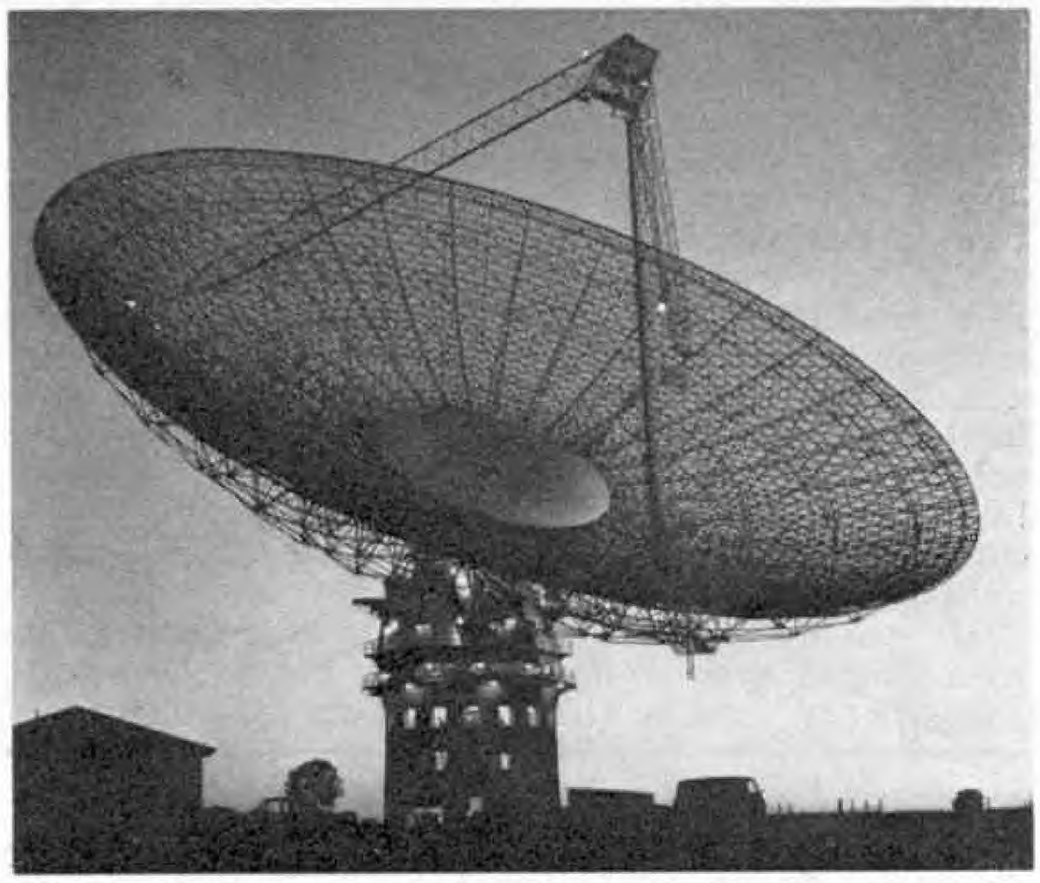
CORRECTION

An apologetic Spanner tells me that in the Among the Model Builders last month he made, and I quote, "The terrible mistake of saying that the 3 in. pulleys with Motor Tyres, acting on the rod wheels for the Front-Wheel Drive Unit, were mounted free, on the Adaptors for Screwed Rod, which served as the drive shafts, being held in place by Collars." In actual fact, the pulleys should be *tightly* fixed on the Adaptors, otherwise the drive would not be passed to the wheels.

EVOLUTION of the UNIVERSE

C. A. RIGBY

ONE OF the earliest subjects in the history of mankind, astronomy has always attracted the scholars of many nations. The ancient Egyptians had considerable knowledge of many celestial bodies, and compiled accurate data on the motions of the known planets in the solar system. The Greeks handed on their knowledge to the Arabs, thus helping to create more interest in the science. Both Chinese and Japanese astronomers, in 1054 AD, observed a "supernova" or exploding star, an observation which is important to present-day astronomers.



Our heading photograph is of two of the three parabolic reflectors, which form the "one mile" radio telescope Mullard Atronomy Observatory, Cambridge.

Photograph courtesy: Mullard Radio Astronomy Observatory, Camb.

Above. Acquired in 1961 for the Radio Physics Laboratory of the Commonwealth, Australia's Radio telescope with its 210 ft diameter parabolic reflector "dish" mounted alt-azimuth fashion is built on farm land some 13 miles north-west of Parkes in New South Wales, and is one of the largest steerable instruments in the world.

Photograph courtesy: Freeman, Fox and Partners.

In 1543, Copernicus published a book on the "Revolution of the Celestial Spheres" in which he formulated the theory that planets revolve around the Sun. In 1609, Galileo invented the first astronomical telescope, thus making detailed observation of celestial objects possible. By this means, the planets Uranus, and later Neptune, were discovered. In the early 18th century, Newton placed the subject on a more scientific basis, and observatories were later built in various countries, including Britain, France and the U.S.A.

In 1924, Edwin Hubble, using the new 100-in. reflector telescope on Mt. Wilson in America, discovered that the nebula in Andromeda was much farther away than any single star he could see, and that it was a disc-shaped stellar system or galaxy isolated in space. Nearby stars also looked alike in type and arrangements, and we now know they are all part of our own galaxy of about 100,000-million stars in which the Sun lies near the outer edge. The present conception of our Earth is that of a cosmic pebble, circling a minor star in one of millions of galaxies, which are apparently rushing away from each other into unknown space, some at speeds greater than thousands of miles per second.

More important still, the 200-in. Hale reflector on Mt. Palomar in California has revealed galaxies over a

thousand million light years distant, our own galaxy being about 200,000 light years wide, one light year being the distance that light moving at 186,000 miles per second would travel in a year. A light year, therefore, is 186,000 × 60 × 60 × 24 × 365 miles, or 5,880,000,000,000 miles approximately. This is a particularly important measurement in radio astronomy for which radio telescopes are used, and these are very different from the ordinary astronomical instruments. (See article in the January number of this magazine [pages 16-17] under title: "RADIO TELESCOPES AND THE COSMIC.")

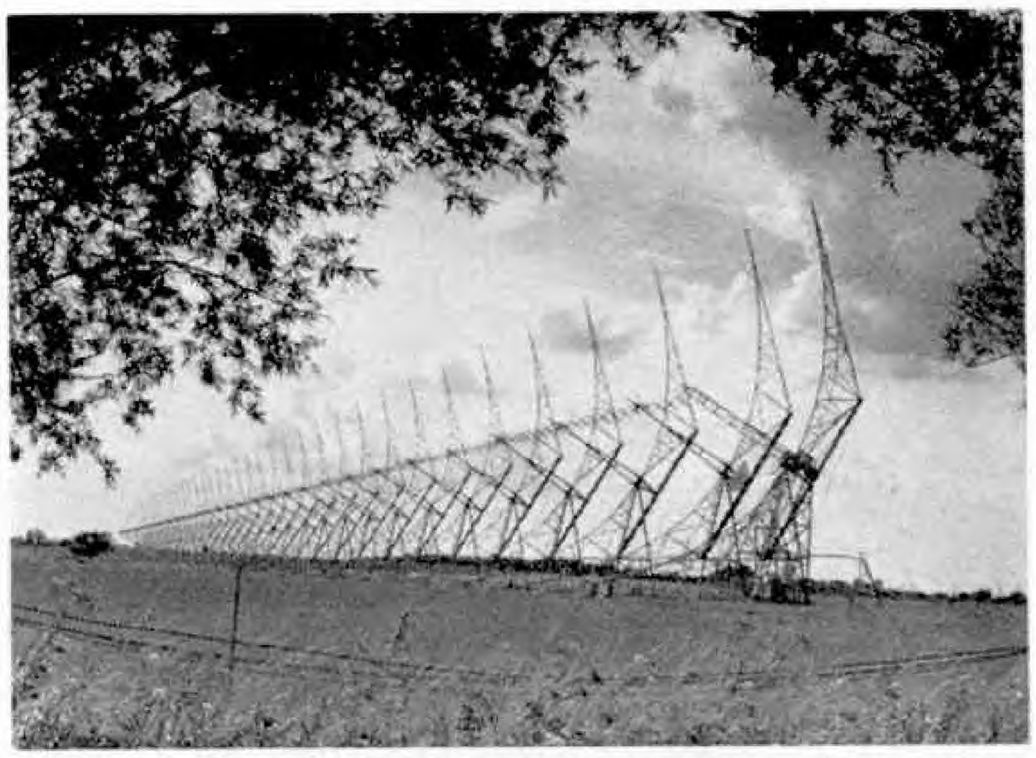
The universe, of course, includes all the celestial bodies such as stars, double stars, galaxies, quasars, supernovae, constellations or groups of stars, meteors, meteorites, asteroids planets, comets, and also ' pulsars ' or ' ticking ' stars, and we can observe the universe only because signals from outer space reach us, and some penetrate our atmosphere. First, there are the waves of visible light together with invisible rays of somewhat longer infra-red and somewhat shorter ultra-violet wave lengths which ordinary optical telescopes use. Secondly, there are the radio waves of much longer wavelength than light which are detected by sensitive radio receivers. Other types of radiation from outer space impinge on the atmosphere and are known as ' cosmic rays.'

High above the earth, what little atmosphere there is may consist entirely of the gases hydrogen, and helium. In addition, it is evident that the gases present between the stars are mostly hydrogen. However, this is so highly rarefied, it is far better than any vacuum which can be produced on earth. In interstellar space, astronomers have good evidence of the presence of calcium, sodium and other elements, also water and ammonia. In the Milky Way system the total amount of material between the stars is probably as much as in the stars themselves.

It is believed that the Sun like other stars, keeps going by a process in which four nuclei of hydrogen atoms combine to form one nucleus of a helium atom, and the energy produced by this process reaches the solar surface and is radiated as light and heat, some reaching the earth. The process of stellar evolution may sometimes be marked by various explosive events. One of these which occurs in large stars, is an enormous explosion in which a large amount of matter is blown away into space in the form of high speed streams of gas. For some days, an exploding star can radiate energy 200-million times as fast as the Sun. Chinese and Japanese astronomers recorded such an occurrence in 1045 AD, and the exploding gases from the object now called the ' Crab nebula,' can still be seen with powerful telescopes, forming a cloud about 3,900 light years away. While it lasts, the explosion shows up as an abnormally bright star, known as a ' supernova.' Sometimes an entire galaxy can explode, becoming a powerful radio source or ' quasar.'

Regarding cosmic radio signals, the strength of these from different parts of our galaxy (The Milky Way) has been mapped in detail and it is known that they come not from the shining stars but from completely different regions. Some of these regions are clouds of hydrogen in which ordinary stars are being formed; others are the remains of burnt-out stars or supernovae which have exploded. Their emissions are received with radio telescopes. Already these instruments have led to the discovery of ' ticking ' stars called ' pulsars ' which continually send out regularly timed signals or pulses.

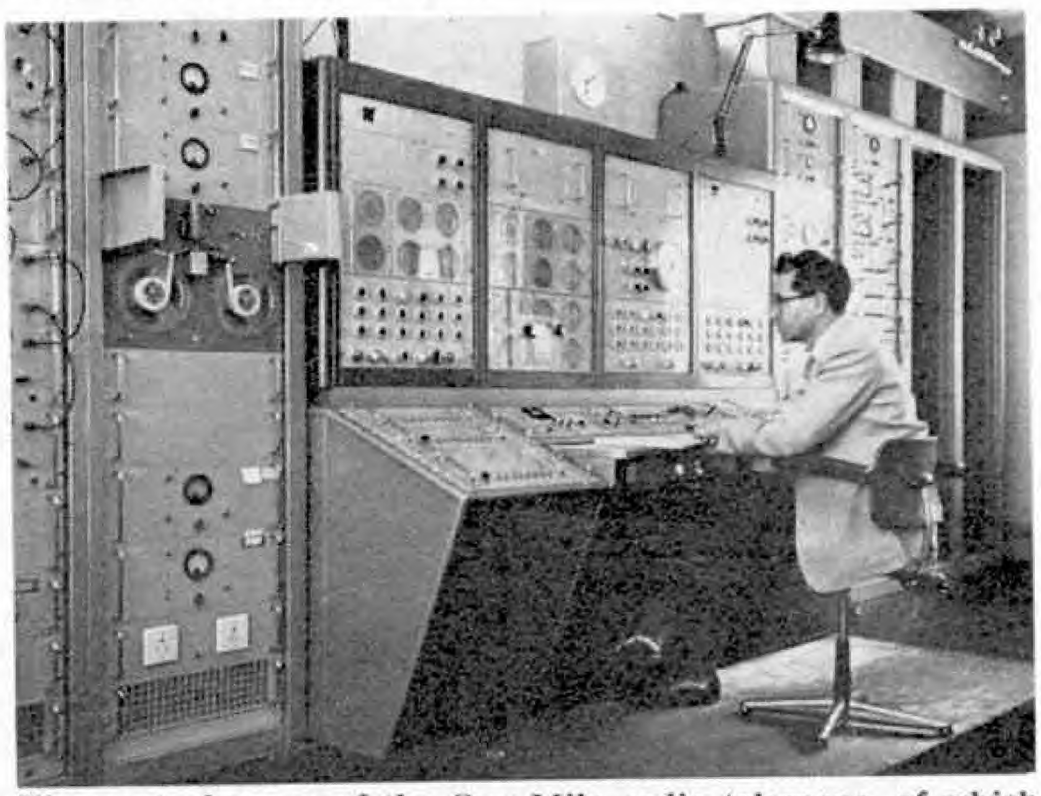
During February 1961, eight British radio astronomers claimed that they had solved the riddle of the universe



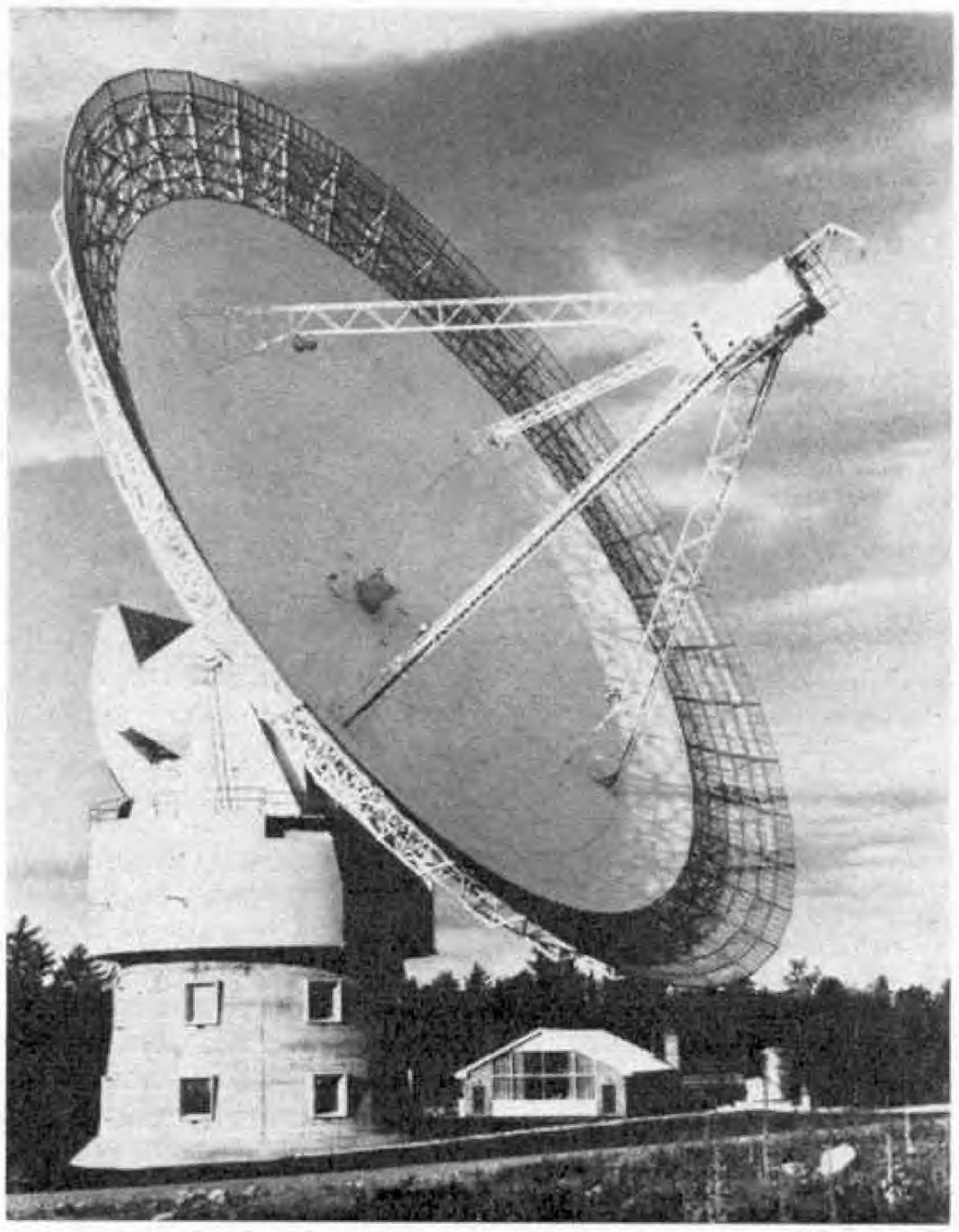
The fixed aerial of the 81.5 Mc/s radio star interferometer until 1965 this aeriel was operating at 178 Mc/s.
Photograph courtesy: Mullard Radio Astronomy Observatory, Cambridge University.

or heaven and earth mentioned in Genesis (Chapter I). According to them, there was a wide-spread explosion about 10,000,000,000 years ago, and our galaxy is one of the small fragments flying outwards from the place where the explosion started. For many years astronomers were divided into two groups. one claiming that something extraordinary had happened to create the universe, and that it has a beginning and possibly an end. The other group headed by Professor Hoyle, claimed that the universe has always been there and always will be.

Professor Martin Ryle who directs an important radio astronomy observatory in Cambridge, claims to have proved that the universe is really evolving and that it may possibly end some day. Computers have analysed the results he obtained from his giant radio telescopes which have picked up faint signals from radio sources 8,000-million light years distant. The result of the count of 1,200 radio sources, too faint to be seen optically but only detectable with radio telescopes, was that there appear to be more radio sources on the edge of the universe than closer in. This does not fit in with the ' Steady State ' concept which maintains that matter is being continuously born so that the universe should remain the same everywhere. The latter was evolved at Cambridge by three astronomers, Professors Bondi, Hoyle, and Thomas Gold.



The control room of the One Mile radio telescope, of which our heading photograph is part, with work on radio astronomy in progress. *Photograph courtesy: Mullard Radio Astronomy Observatory, Cambridge.*



Canada's largest steerable radio telescope, with 150-ft. parabolic "dish" reflector at ALGONQUIN PARK, ONTARIO, was acquired by the National Research Council. *Photo by courtesy of Consulting Engineers, Freeman, Fox and Partners.*

What then was the universe like 10,000 million years ago when it exploded? Even now the scientists are not quite sure. According to one view it was a mighty atom, unbelievably dense but much bigger than the Sun, only a few million miles across. There is another idea even more spectacular but seriously held by some astronomers that there was nothing solid at all, but only intense radiation at a temperature of 1-billion degrees or more.

With the use of radio telescopes more and more has been learned about the cosmic. At this stage, the cosmologist takes over from radio astronomers and endeavours to fit the facts revealed by astronomy into his conception of the universe, but this now is conceptual and mathematical. For example, Einstein's conception is of a finite, curved, 4-dimensional space forming a closed 'spherical' structure. The universe is known to be expanding, and on one theory, in the future galaxies will be so remote from one another that the cosmos will cease to exist as a whole. A theory advanced by Tolman is that there are two fundamental forces at work in the universe, namely one of 'repulsion' from the central explosion of a single compact super-atom, and one of 'attraction' deriving from the condensations of matter in space; and the expansion will go on until all the forces balance each other. The universe will then fall in upon itself with increasing velocity until another super-atom is created, and the process may start all over again.

Here again, regarding the formation of the Earth, its 'cooling' must be taken into account when considering its age. That the deeper parts of the Earth's crust are much hotter than those near the surface has long been known. If, as many believe, the earth was at one time a mass of intensely hot gases and vapours which gradually passed through the liquid to the solid state as it lost more and more of its heat, then the high temperatures of the interior are easily explained. In assessing theories, scientists must consider all the known facts. Astronomical and radio telescopes, in particular, help us to go farther and farther back in time, or the history of the universe, because we see distant objects as they were long ago. If it is possible to go further back in time than 5-10 thousand million years in this way, then astronomers would be nearer to understanding the true nature of the universe.

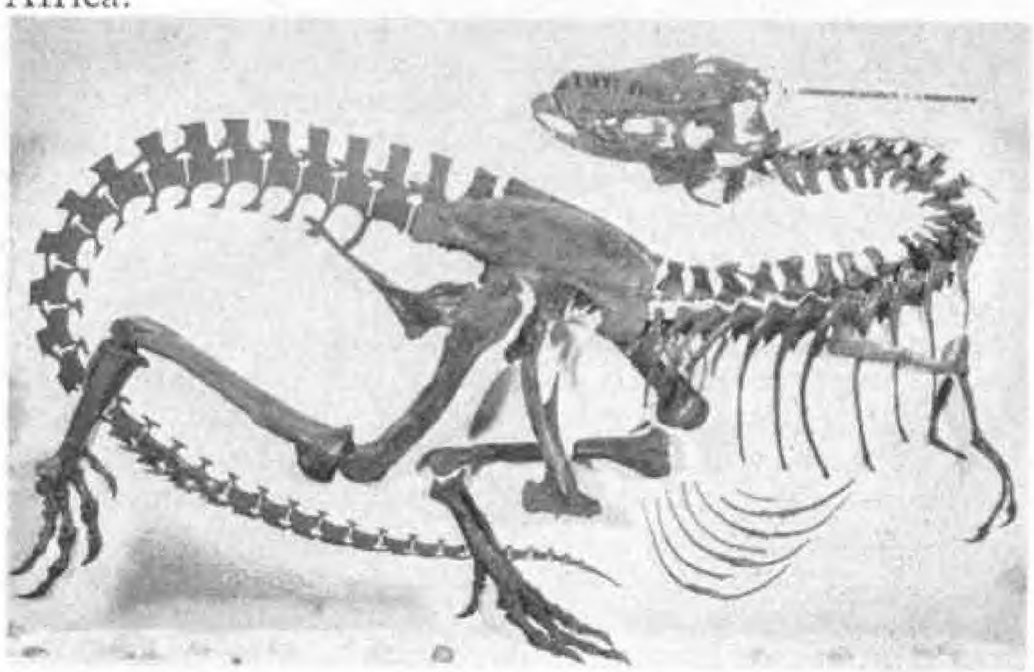
We know the age of the Earth is from 3-4,000 million years, approximately, and so the universe as a whole must certainly have been formed earlier than this. This riddle will certainly keep astronomers occupied for many years to come.

Reptiles. These fossils were found in the high prairies and mountains of western United States. When the animals were living there, 70 to 180 million years ago, the area consisted of low, well-watered plains close to an inland sea.

In addition to dinosaurs, reptiles that represent the ancestry of mammals, are also displayed. These animals were apparently never abundant in the United States, and the fossils of this group were collected in South Africa by an expedition sponsored jointly by the Smithsonian Institution, U.S. National Science Foundation, and the Bernard Price Institute for Paleontolgical Research, Johannesburg, South Africa.



Above is the skeleton of the stegosaur, which lived about 125 million years ago, and has the dubious distinction of belonging to the only group of dinosaurs to become extinct before the end of the Mesozoic Era.



This photograph shows the skeleton of the Gorgosaurus Libratus.

when DINOSAURS ruled the EARTH

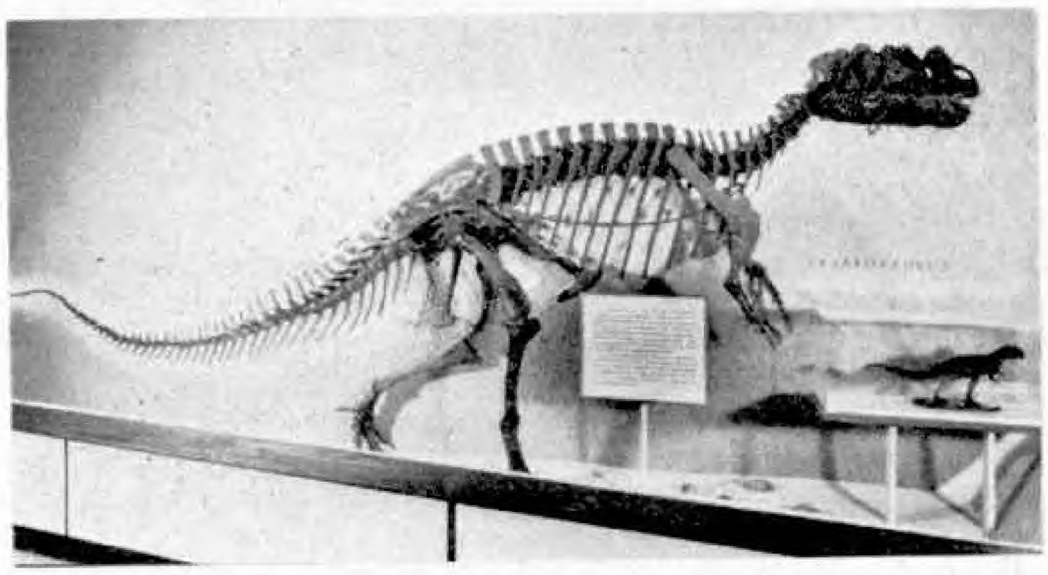
THE SMITHSONIAN INSTITUTION, Washington, America's national museum, has opened its newly renovated exhibit of dinosaurs and other fossil reptiles, the most significant collection of its kind, in the Institution's "Museum of Natural History" department. The new exhibit features in colourful and dramatic settings more than 24 skeletons and skulls of the largest land animals the world has ever known.

The Smithsonian's collection of fossil reptiles is of great historic as well as scientific interest. They are the result of over a century of exploratory field work, some of which dates back to the United States Government's early surveys of western frontiers. In addition, they present well over 50 years of careful preparation and study in the Institution's laboratory which must be credited largely to the devoted scientific work of Charles W. Gilmore, late curator of vertebrate paleontology, and the skill of his chief preparator, N. H. Boss. Paleontologists the world over know of the material displayed in the new exhibit.

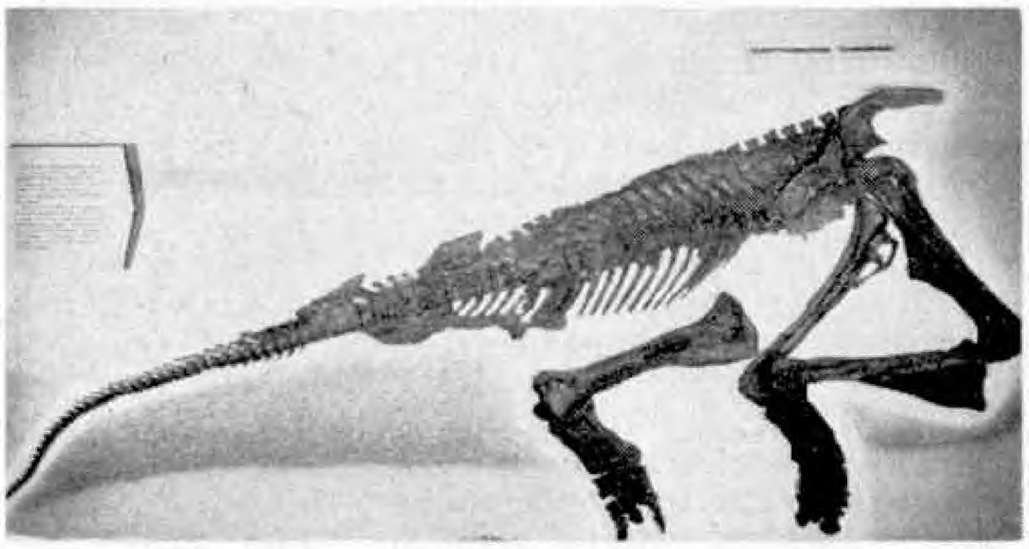
The dominant figure in the exhibition hall is a skeleton of the giant sauropod dinosaur *Diploducus*, which in life was 80 feet long and weighed about 25 tons. All major groups of dinosaurs are represented in the exhibit, including animals ranging in size from one whose arm bone was 6 ft. long to a tiny beast with a thigh bone smaller than that of a chicken.

A number of specimens are unique such as the skeleton of *Thescelosaurus*, a small, agile, plant-eating dinosaur that lived near the end of the Age of

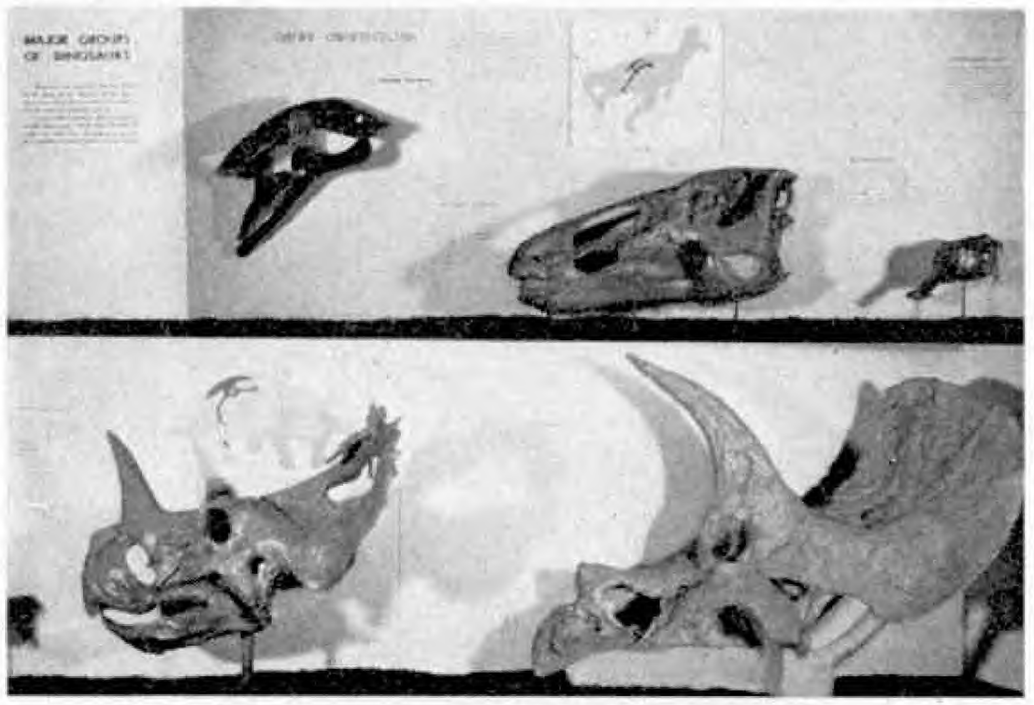
(*Continued opposite*)



Above is the skeleton of toe Ceratosaurus of the late Jurassic age, and pi obably preyed on creatures similar to that in the heading photograph.



This specimen, although incomplete, shows a number of anatomical details of the Duck-Billed dinosaurs.



The specimens shown above are of the major groups of dinosaur including the "Duck-Billed" type, lower two skulls are of the Monoclonices Flexus and the Triceratops Elatus.

NEW MECCANO QUADRANT

described by Bert Love

IN VIEW of the interest aroused by the announcement of the new Meccano Large-toothed Quadrant last month and its tremendous value to the system, we felt that it would be well worthwhile if we studied it in greater detail here. Bert Love, with whose co-operation the Quadrant was developed by the production department at Liverpool, has supplied the illustrations and the following descriptions of the new part and some of its applications.

"The Meccano Large-toothed Quadrant, Part No. 167a", writes Bert, "fills a long-felt want among Meccano enthusiasts in providing a heavy-duty curved rack with which large turntables and other circular gearing can be constructed. When four of the Quadrants are bolted to a Flanged Ring, Part No. 167b, they form a perfect double circle of teeth making

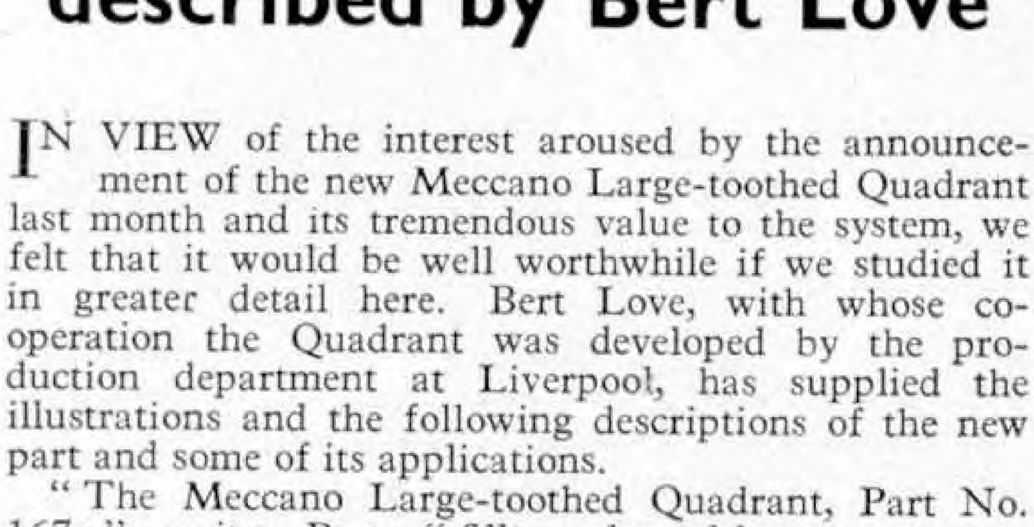
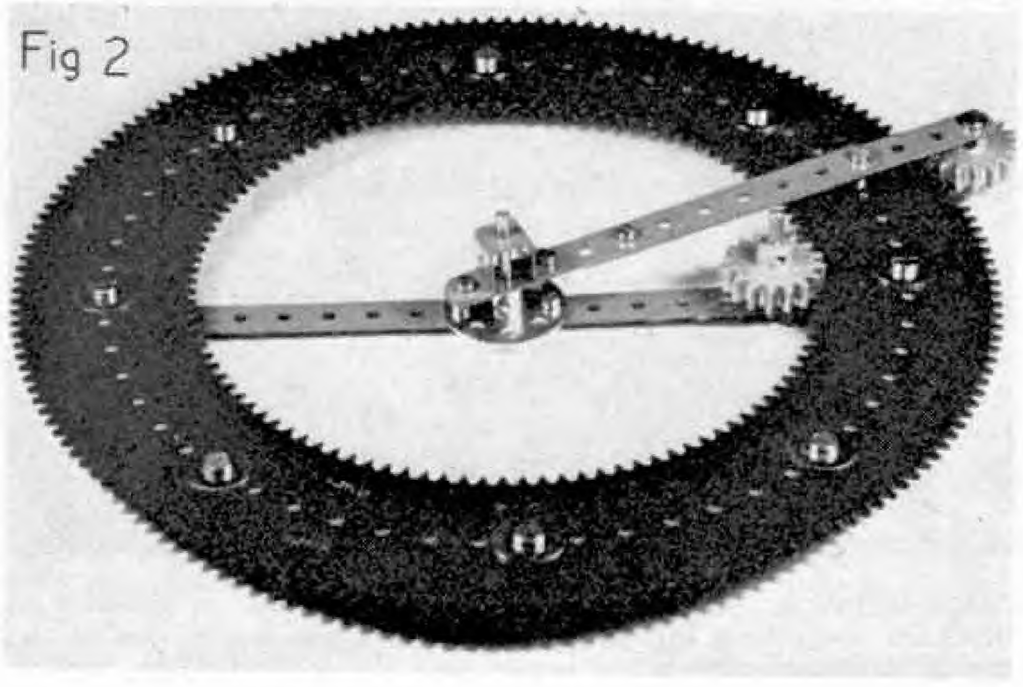


Fig 1

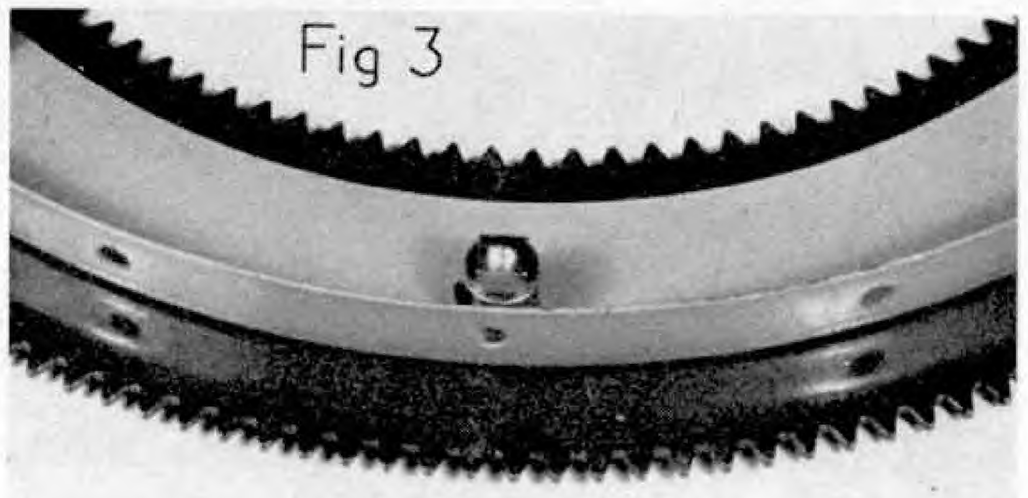
a rugged geared slewing ring, about which a superstructure may be rotated either by an internal or an external drive from the new special Pinion, Part No. 167c, as shown in Fig. 2.

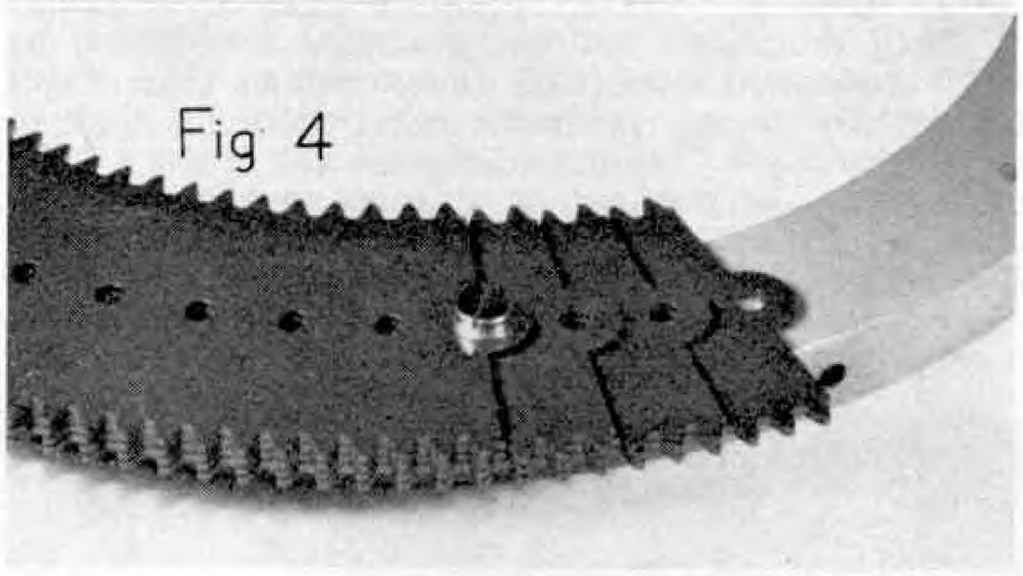
"The problem of getting the four Quadrants in perfect radial alignment without an overlapping join has been ingeniously solved in the basic design. It will be seen from Fig. 1 that at one end of the Quadrant there is a rounded nose while, at the other, there is a rounded recess. This ensures that the 'head' of one Quadrant is a snug fit into the 'tail' of the other


Fig 2

and, when these are bolted in place round the Flanged Ring with Pivot Bolts and $\frac{3}{4}$ in. Washers, as shown, they form a perfect continuous circle.

"Older enthusiasts will be interested to know that the new 167c Pinion is similar in size and design to its pre-war counterpart and within certain limits, the two are interchangeable. The new Pinion, however, follows standard engineering practice of being made with an involute tooth form, as are the teeth on the Quadrant. This ensures a very smooth meshing of Pinion and Quadrant. Furthermore, the face of the new Pinion is approximately $\frac{1}{16}$ in. wider than that of the pre-war example so that the new part has a little more latitude in being set up.


Fig 3


Fig 4

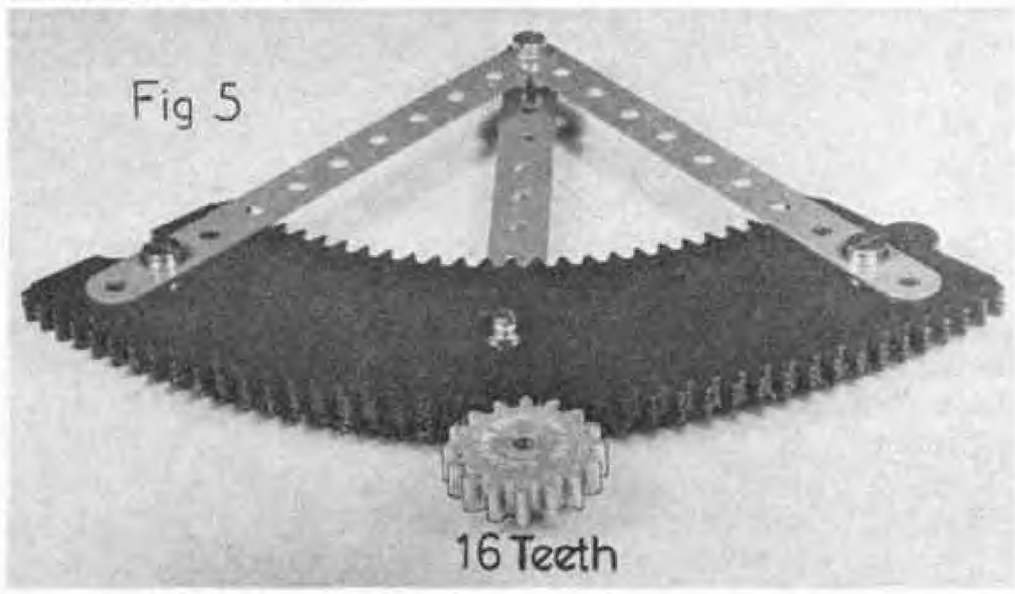
"Fig. 2 shows the spacing centres and radii for internal and external drives to the Quadrant, these radii being 3 in. and 6 in. respectively. At first glance this might convey the impression that the ratio of external teeth to internal teeth is 2 : 1 but the difference between internal and external gear-running must be borne in mind and, once again, it is a matter of 'counting the teeth'. Fig. 1 shows that four Quadrants would have 4×42 teeth $= 168$ externally and 4×27 teeth $= 108$ internally. This gives a ratio between the two circles of teeth as $168/108 = 14 : 9 = 1.555$ (recurring) Pinion/Rack ratios are as follows:—External $168 : 16 = 10.5 : 1$ (exactly); Internal $108 : 16 = 6.75 : 1$ (exactly).

"Accurate tracking of the Quadrant teeth when formed to a complete circle is ensured by careful selection of tooth form and the precise division of the 'trough' between two teeth at either end of each Quadrant on both sets of teeth. Fig. 3 shows a close-up of the junction between two Quadrants bolted to a 167b as seen from below. Even at full-scale enlargement, it is very difficult to see the 'join' and continuity of the meshing as the Pinion rolls over the join is perfect. A further feature illustrated by Fig. 3 is the generous 'overhang' of the Quadrant beyond the flange of the 167b. This allows the application of 'hook' rollers when a circle of Quadrants is used in a crane turntable. The hook rollers would run round underneath the protruding edge of the Quadrant and

would prevent the boom of a heavy crane from tilting the upper portion of the turntable. Such a feature constitutes current engineering practice and in next month's instalment of Meccano Constructors Guide, a complete crane turntable will be featured making use of the new Meccano Quadrant.

" Fig. 4 shows how the Quadrant may be ' stacked ' to provide a very rugged gear rack capable of taking advantage of the full width of the face of special Pinion 167c. Each Quadrant is perforated with 14 holes and, as this is a sub multiple of 42 (the number of external teeth per Quadrant), they may be staggered, as shown, to make up racks covering a wide range of angles from 90° up to 360°. Fig. 5 shows a very solid 90° Quadrant made up from four of the new parts stacked together and pivoted on a 4½ in. radius. The Quadrants are reversible so that Fig. 5 could be rebuilt with two rounded ends at the right and two at the left. This would then give securing points at the extreme ends of the built-up Quadrant with perfect teeth registration. Thus the field of bridge-building, crane luffing, fairground machinery and adjustments on machine tools is opened still wider to the Meccano enthusiast by the introduction of this latest addition to the versatile Meccano system.

The price of each Quadrant is 8/-d. and the special Pinion 167c is 8/9d.



MECCANO AT 1970 M.E. EXHIBITION

Photographs and report by Bert Love

SUB-ZERO temperatures and widespread 'flu were no match for the enthusiasm of a vast crowd of dedicated visitors who flocked to Seymour Hall, London, in the first week of the Model Engineer Exhibition which was opened to the public on December 31st. The author's original intention of making a bee-line for the Meccano Stand was thwarted by thronging crowds who surrounded every stall and demonstration from one end of the Hall to the other with generous overflows to the balconies above.

On arrival at the Meccano Stand, all models were obscured by many fascinated members of the public who pored over them with eager eye for detail and movement. The central display, shown in Fig. 1, drew

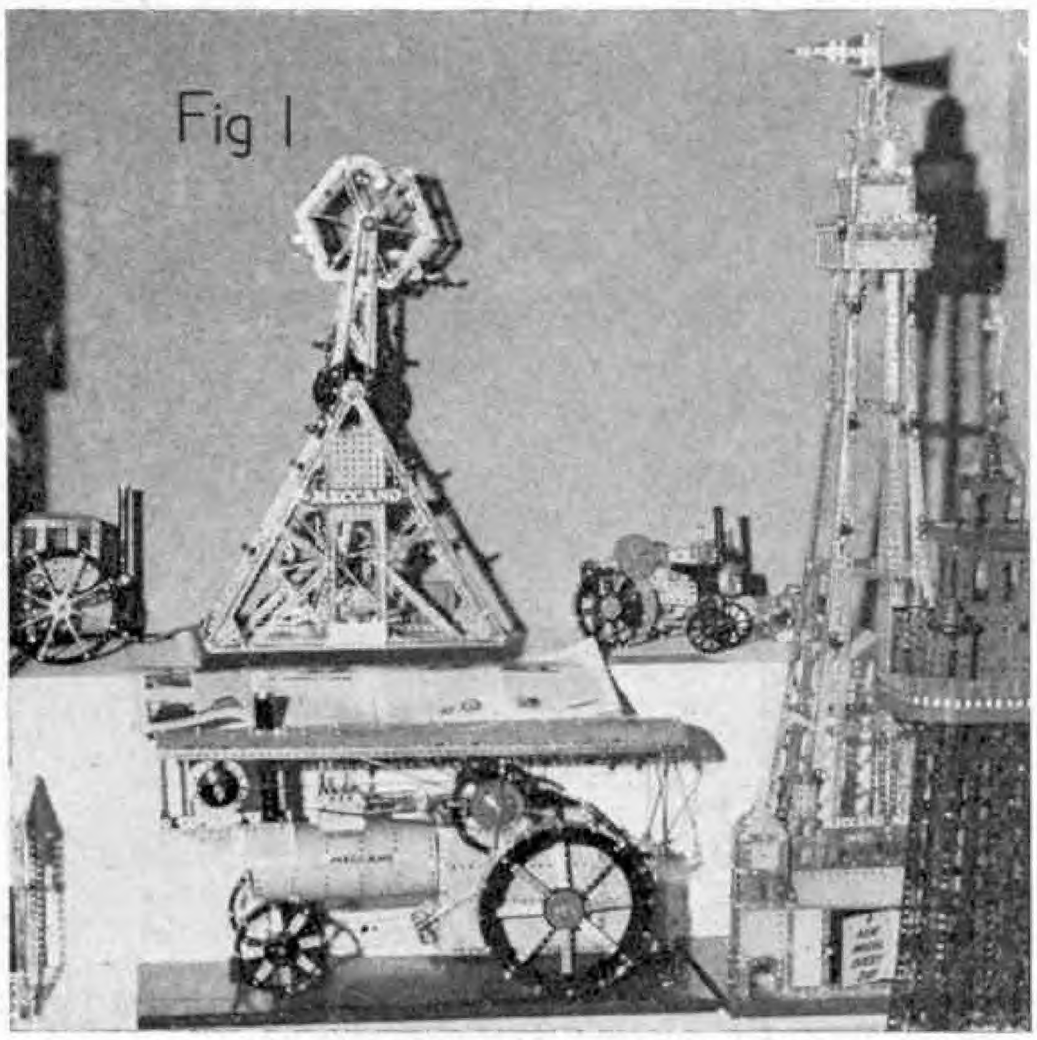


Fig. 1. Some of the models on view at the Meccano stand at the 1970 Model Engineer Exhibition. Some of the models were supplied by Meccano Ltd., but there were several submitted independently by readers for judging.

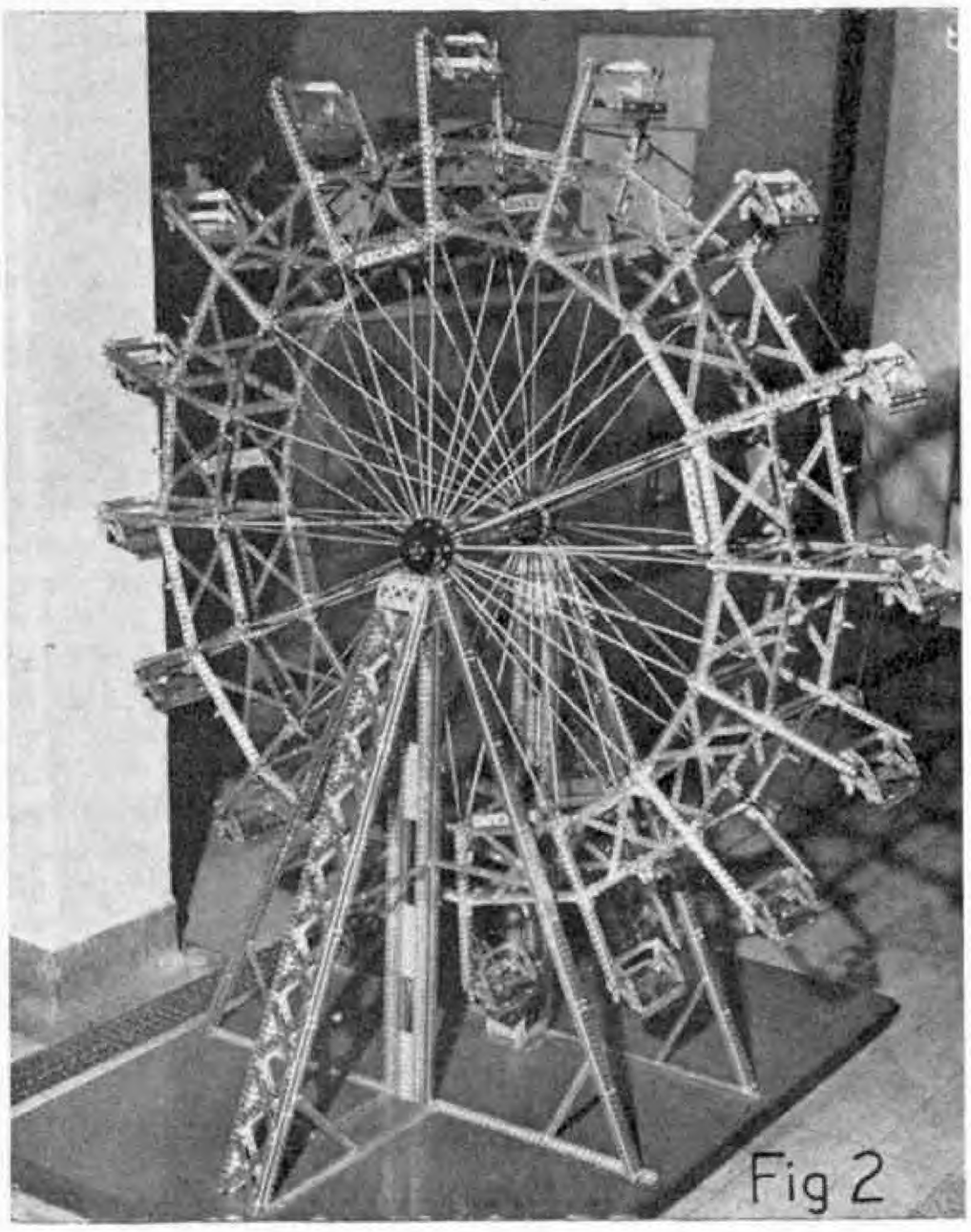


Fig. 2. One of the factory-built models at the Exhibition was this giant Big Wheel, the revolving wheel alone having a diameter of six feet.

the attention of visitors with its working models, prepared in the factory at Liverpool, with coloured lights and working mechanisms, the Showman's Traction Engine being a popular focus on the stand. A Giant Ferris Wheel, shown in Fig. 2, with a 6 ft. diameter wheel, continued to run smoothly throughout the exhibition thanks to the rugged and ingenious construction supervised by Bob Moy at Liverpool. Despite its size and heavy centre bearing, Meccano Constructors will be interested to learn that no 'gimmicks' or special parts are required for the rotating mechanism but careful selection of parts and the use of standard Gear Rings, Sprocket Wheels, Hinges and Slotted Couplings enable a very strong hub and spoked wheel to be constructed. The main driving band is in leather (rather like that used on a treadle sewing machine) and wide-mouthed guide pulleys are constructed from ordinary ½ in. Loose Pulleys fitted with Conical Wheel Discs to form the wide 'cheeks' and these are held in place by 1 in. Pulleys with boss fitted with 1 in. Rubber Rings to support the Conical Discs. Even the large main driving pulley is constructed from Standard parts and its drive from the Mains Motor is via Meccano Axle Rods, and Sprocket Wheels. Coloured lights on all of the demonstration models are mounted in Lamp Holders and current is supplied via standard Commutators and Wiper Arms.

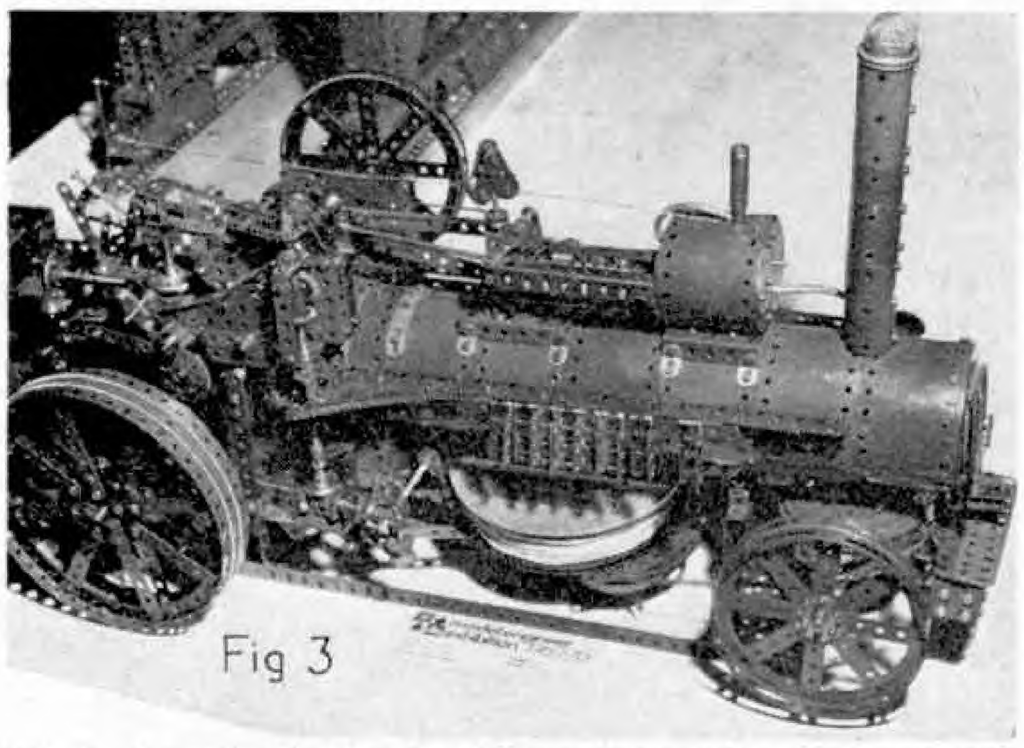
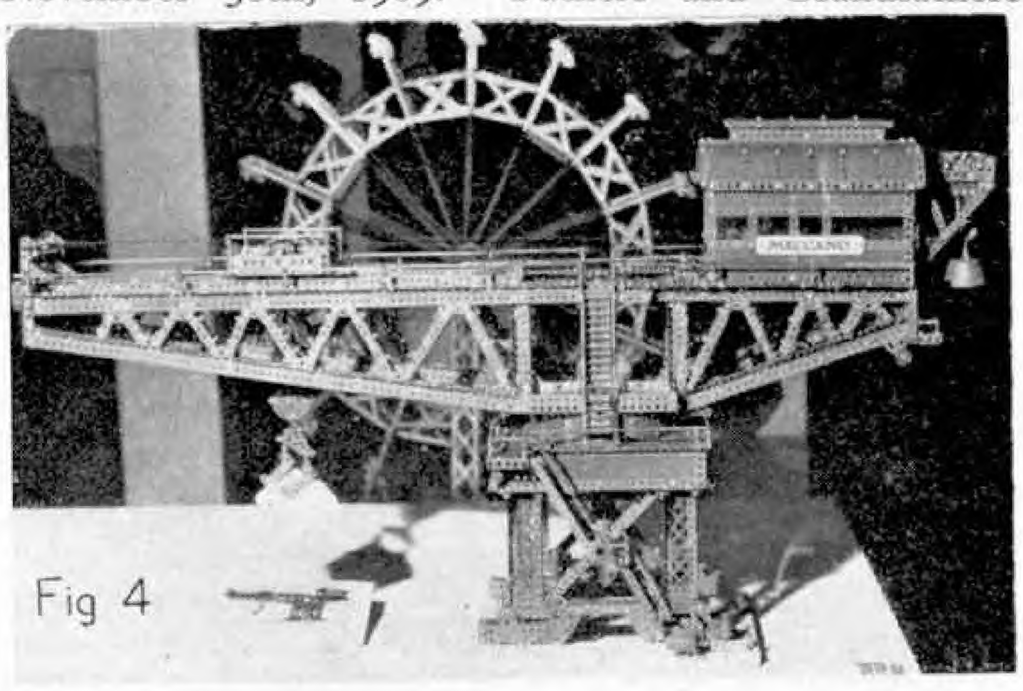


Fig. 3. A particularly interesting model at the show was this Steam Ploughing Engine designed and built by Colin Balde of London, a 14 year old.

Turning to the open display table, this had some competition models on it and the winner of the Meccano Cup was H. J. Halliday of London, a skilled and veteran Meccano modeller. He exhibited a mini Showman's Road Locomotive in a 'glass' case made of Angle Girders, Narrow Strips and Transparent Flexible Plates and despite the small size of the model, being some six or seven inches long, it was remarkably well detailed and it is hoped that this may be featured in a subsequent edition of the Magazine. The model shown in Fig. 3 is particularly interesting as it was built by a 14-year-old London boy, Colin Blade and is quite remarkable for its detail and proportions. Built to a boy's budget with parts inherited from 'Dad' and gleaned from many sources and decades the model reproduces all the movements of the prototype 19th Century Steam Ploughing Engine and is complete with wooden wheel chocks, water suction hose and steam whistle fashioned from a spent cartridge case !

Although not entered as a competition exhibit, the Block-Setting Crane featured in Fig. 4 created tremendous interest among visitors of all ages. This freelance model by the author kept him very busy throughout some eight hours of exhibition time answering a host of questions on constructional features of the crane, a coloured photograph of which many enthusiasts had seen in the *Sunday Observer* Colour Supplement for November 30th, 1969. Fathers and Grandfathers



lingered to reminisce over their ambitions to build a similar model in their youth and many were encouraged to look out their stocks of Meccano with a view to a return to this wonderful hobby. Fig. 5 gives some idea of the rugged construction of the Block Setter which is, incidentally, built entirely from currently available Meccano parts, no obsolete items whatsoever being required.

Although a 'lull' in the exhibition hubbub was chosen for taking the accompanying photographs, it was still necessary to ask the public to stand away from the displays to get clear shots of the models and despite their obvious enthusiasm, the visitors were most co-operative in this respect.

Block Setting Crane

In view of the widespread public interest and enquiries from Meccano Constructors all over the country for the Block Setting Crane, full Building instructions and sets of whole plate photographs have been prepared. Details of how to obtain these may be had from:—

B. N. Love, Hon. Sec., Midland Meccano Guild, 61 Southam Road, Hall Green, Birmingham, 28.

A foolscap (9 in. × 4 in.) s.a.e. should be enclosed.

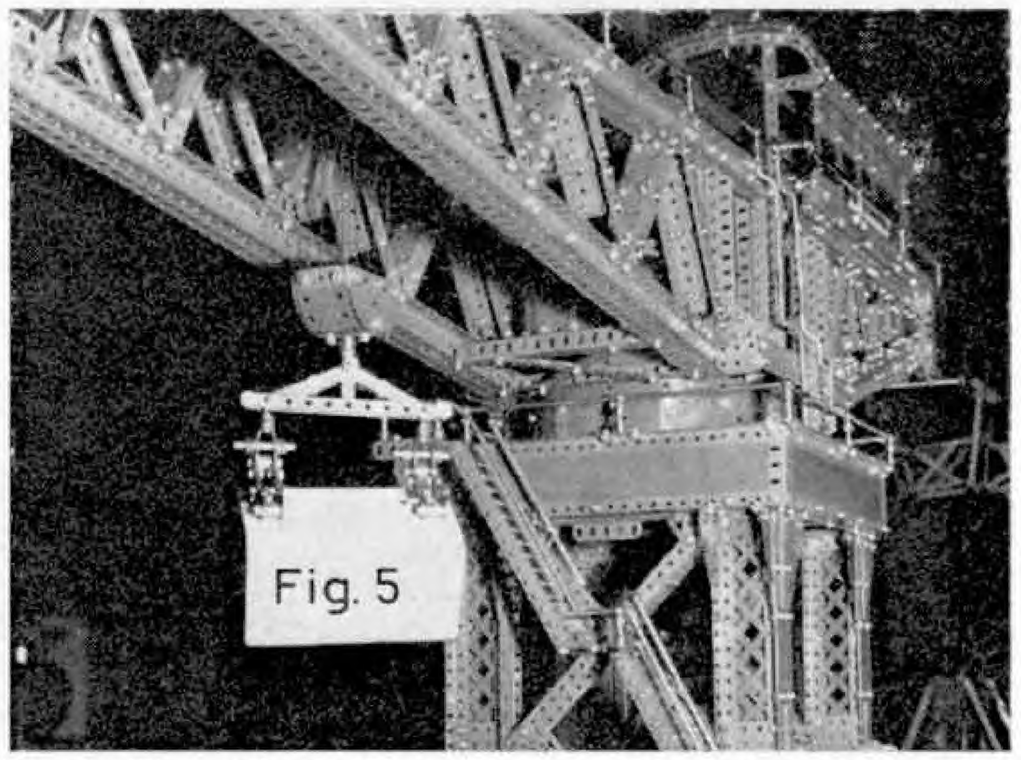


Fig. 4. The author's Giant Block-setting Crane which many visitors to the Exhibition recognised as being based on the model featured for many years on early Meccano Instruction Books.

Fig. 5. Another view of the Block-setter, showing the fine construction detail with its tremendous impression of strength.

CHINESE ART TREASURES ON STAMPS

By James A. Mackay



THE CIVILISATIONS of Asia are of such antiquity that it is often difficult to comprehend just how long ago the Chinese enjoyed a high degree of sophistication. Four thousand years ago Chinese, potters, sculptors, painters and craftsmen were at work, producing articles of great beauty which have never been surpassed. A veneration for ancient traditions resulted in even the earliest examples of Chinese art being preserved while archaeological discoveries in the early years of this century brought to light exquisite bronze figures, gold, jade carvings and even fragments of ornamental textiles manufactured in the time of the Shang Dynasty which dated from 1765 B.C.

Although Chinese art became widely dispersed throughout the western world in the nineteenth century the best examples were preserved in Peking. When the Nationalists evacuated the mainland of China in 1949 they managed to transfer the bulk of these treasures to Formosa where they were installed in the National Palace Museum in the capital Taipei. Today this museum houses the largest and most valuable collection of Chinese art in the world. The collections range over every field of art, from the time of the Shang-Yin right down to the end of the Ching Dynasty in 1911 when China became a republic. Each year thousands of tourists come from every corner of the globe to visit the museum while famous institutions send their experts to Taipei to study certain items in the collections.

The Chinese are naturally proud of their ancient cultural heritage and have publicised the treasures of the National Palace Museum in several sets of stamps which have appeared, usually at annual intervals, since 1961. The period of the Shang Dynasty coincided with the Bronze Age in China and so it was appropriate that the first series of art stamps should include an example of a finely decorated wine vase of the Shang period. A *Tsun* wine vase of the same dynasty, dating about 1500 B.C. was shown on a stamp of the third series (1962).

Under the Chou Dynasty (1122-249 B.C.) the manufacture of bronze articles was developed to its finest; a bronze cauldron (1961) and a bronze bowl (1962) were shown on stamps to represent this period. During the Chou Dynasty jade carving became fashionable and a perforated tube in this material was featured on one of the 1961 stamps. A sacrificial vessel from the western part of the Chou empire was shown on a stamp of 1968.

The Han Dynasty (202 B.C.-220 A.D.) witnessed the most rapid development in every aspect of Chinese art and it was also in this period that paper was invented. Representing the Han Dynasty was the jade chimera (legendary monster) on a stamp of 1961, a jade perforated disc (1962) and a black jade carving of a shepherd and ram (on a stamp issued in January of this year).

The period following the downfall of the Han rulers is known as the era of the warring states, 400 years of intermittent civil war. A jade battle-axe on a stamp of 1968 represents this period. China was re-united under the Tang rulers (618-907) and this dynasty was notable for the development of painting and pottery. The art of painting lengthy scrolls of landscapes was practised at this time and a series of seven stamps of 1968 was devoted to the famous picture entitled "A City of Cathay." Five of the stamps were $1 denominations printed side by side in order to show the last 11 feet out of the 27-feet long painting.

The Sung Dynasty (960-1279) is best remembered artistically for the invention of porcelain. A vase and a bowl in this material were shown on stamps of 1961 while a Lung-chu'an flower holder of this period appeared on one of the 1968 series. The Ming Dynasty (1368-1644), however, witnessed the finest flowering of Chinese art and it is hardly surprising that many of the stamps in these sets represent this period. They include porcelain vases and bowls (on various stamps of 1961 and 1962) and a Hsuan-te "heavenly ball" (1969).

The strength of the National Palace Museum collections, however, lie in the Ching period (1644-1911) and the stamps showing art of this dynasty range from an imperial perfumer (1961) and porcelain jar (1962) to the enamelled vase and agate flower-holder (1968). Most of the stamps in the 1969 and 1970 sets have featured examples of Ching art: a jade buckle, enamelled teapot and gourd vase in last year's series and a lacquer vase, agate grind-stone and Chien-lung porcelain jar (January 1970 issue). The latest series, consisting of six stamps, was put on sale on January 23rd and accompanied by colourful First Day covers and descriptive mounting folders.

OLD TIME MACHINERY

Edyth Harper looks back at the inventions of a bygone age . . . .



Above. A tram built almost 40 years ago and now restored to its former glory is seen here at the Crich Tramway Museum.

Below. This monument dedicated to Thomas Newcomen, stands in a Dartmouth park. The illustration shows his atmospheric machine, widely used in Cornwall for pumping water from the mines.



EVERY AGE produces improvements. Where machinery is concerned this means that some machines become obsolete. Many are destroyed, but out of date machinery can still be seen today if you search it out and certain machines are still in working use.

For centuries all over Britain corn was ground into flour in windmills. Today only about a dozen remain. One of the oldest is the Pitstone Mill, Bucks, thought to date from 1627. Flour is produced by modern factories, and mills are more picturesque than useful, but a splendidly restored mill can be seen at Heckington, Lincs., the only mill in the country to have eight sails. Not all mills are worked by the wind, however; some relied on water power from rivers and streams, particularly in the North of Britain. The 5,000 mills listed in Domesday Book were all worked by water. Today many of these old water wheels are still turned by rivers and streams to generate electricity. Formerly the force of the water turned the wheel to work the large stones grinding the corn. A good example can be seen at Mapledurham.

Our loaves today are factory baked, but, if you see an old cottage with protruding round extension on one outer wall, it is almost sure to be a bread oven, fired by bundles of faggots and wood. They were in everyday use in past years when bread was normally baked at home. Cottages in West Somerset and North Devon particularly have many examples of these old fashioned ovens. Some are still in use and continue to turn out their quota of delicious hot new loaves.

No one can say for certain when the last turnspit dog was employed. Probably their toil ceased early in the 19th century. It was a cruel custom, for the dog trotted on a turning wheel. Nearby a joint of meat, impaled on a spit over a fire was turned by the rotation of the wheel. If the animal stopped, hot coal was dropped in the wheel. Sometimes the wheel was used to churn butter. Examples can be seen in the George Inn at Lacock and in St. Briavel Castle, Glos. Queen Victoria is said to have owned a turnspit dog, but it is doubtful if it ever worked in the Royal kitchens.

Inventors have long been active in producing machinery of all kinds, especially in the mining industry, which has seen many changes in the last

century. In Cornwall an example of the old beam engines, used in pumping water from the tin mines there, can still be seen at Carn Brea. Hand looms too have been replaced by vast looms operated by machinery in factories. Once the wool was spun and the yarn was woven by hand into material, using traditional patterns and textures. A few craftswomen still make hand-woven goods, especially in Wales, but, in general, our cloth comes from a manufacturer's loom nowadays.

Spinning wheels too are still used, in some craft centres where wool is still spun on these old wheels which were once found in almost every cottage. The rough sheep's wool was collected from the hedges and spun by village women into skeins of wool. A foot tradle caused the wheel to rotate. This was a slow process, however, and men invented machines to take the place of the one-woman power wheel.

On our farms machines have ousted horses. New inventions led to much old farm machinery being destroyed or finding its way into museums. Seed is sown nowadays through a drill, but in some rural areas it used to be sown by a ' fiddle.' This was a device holding the seed which was slung over a man's chest. He worked a ' bow ' across it and the seed was scattered on the ground as he walked. Reaping and threshing machines too have been replaced by combine-harvesters which do everything from cutting to sacking the corn on the spot.

You probably turn a tap to obtain water, but in isolated country districts with no regular water supply, people still use pumps or turn a handle to pull up a bucket of water from a well, on a rope. Made of iron, these old pumps have been in use for centuries but are difficult to replace when parts wear out as few are made nowadays.

In some country districts too, stone presses were used communally for many purposes. During hard winters gorse was crushed in the press to provide cattle food. Similar presses on a smaller scale crushed apples—the juice ran down a gulley and was collected for cyder making.

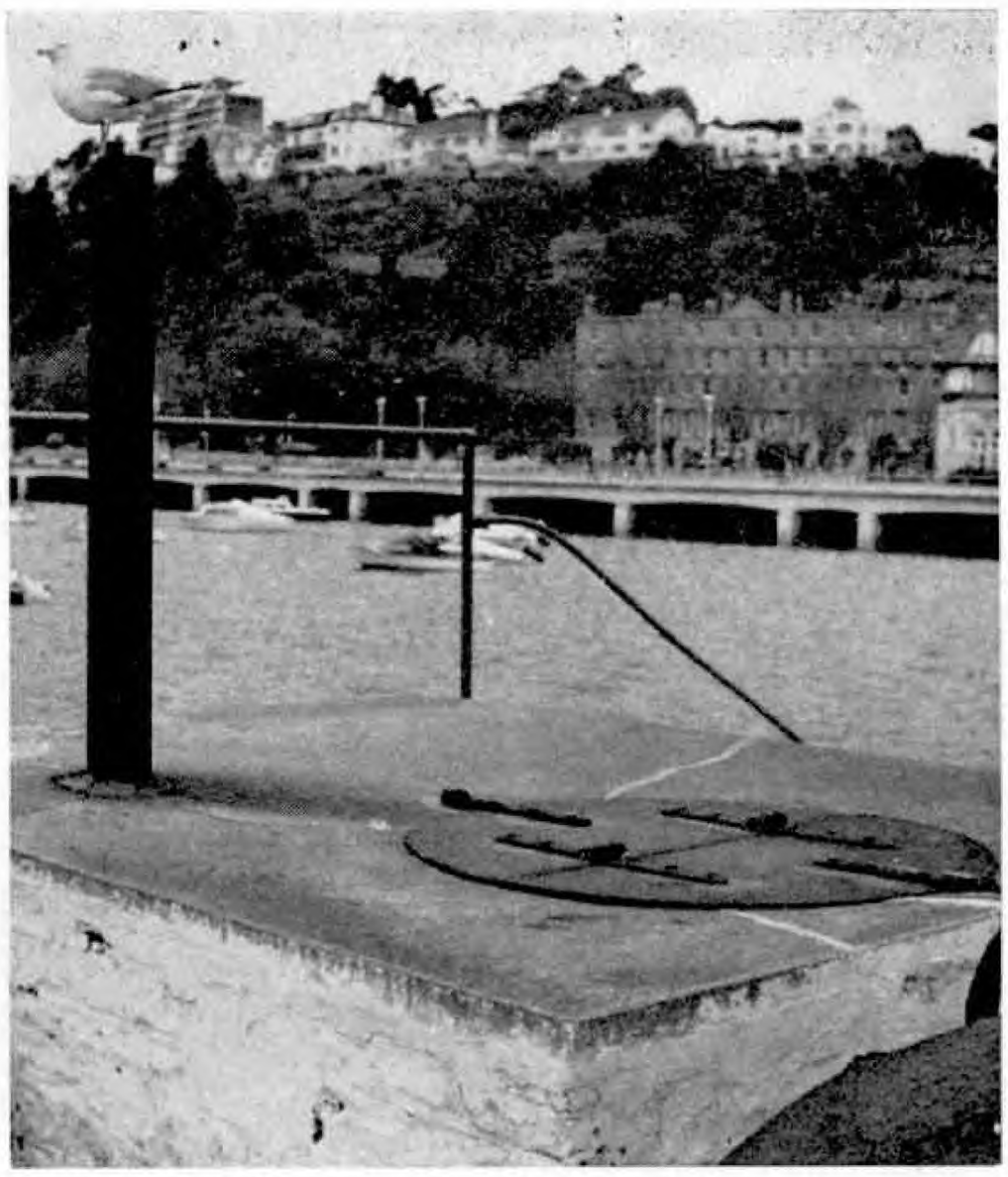
In the world of the railway the last fifty years have seen much railway stock become redundant. Modern train engines bear little resemblance to Stephenson's Rocket, visible on Darlington Station. Some old engines and trains are still working today. ' Prince,' a narrow-gauge locomotive, 100 years old, still carries passengers on the Festiniog Railway in North Wales. A tram built in 1934, and used in Sheffield until 1958, can be seen, and boarded, at Crich Tramway Museum for it is in use to transport visitors there.

Even fishing has been affected by modern machinery. A boiler at the end of South Pier, Torquay, was heated when nets were made of twine which had to be cured before use. Local driftwood was collected by fishermen from the harbour and used with 1 cwt. of coal to fire the square boiler. Inside a mixture of creosote and tar called ' Crutch ' was boiled. Nowadays more and more nets are made of nylon and the old boiler is not used, except as a resting place for sea-gulls.

There are very few of the old paddle-steamers left in service. A few still carry trippers along the South coast, but the development of the modern engines put an end to the production of paddle-driven boats.

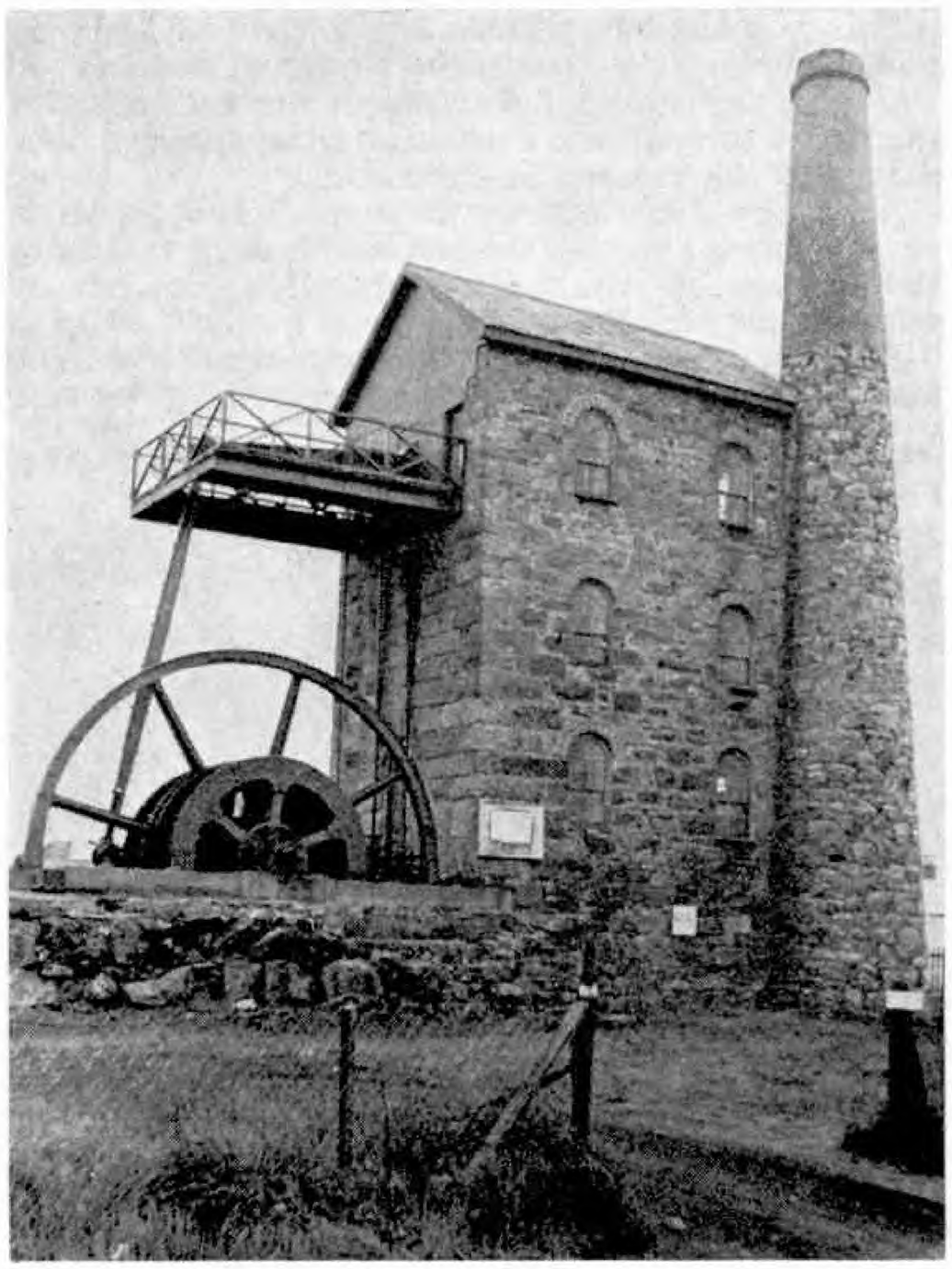
Jet planes have made planes with propellers obsolete, but many still fly.

Progress inevitably means change, and few would halt it, but while we enjoy its benefits, we can well spare time to admire the ingenuity of our ancestors, for without their skills, our modern machines might never have evolved. *Photographs by R. Bristow.*



Above. This boiler situated at the end of South Pier at Torquay was used to boil creosote for covering fishing nets.

Below. Now preserved, this Beam Engine used for mine pumping was once a familiar sight on the Cornish landscape.



CHARING FOR SEA MONSTERS

by Michael Lorant



A diver prepares to remove a dead shark from the main tank at the Miami "Seaquarium".

THE MAIN tank at the Miami "Seaquarium," Florida, the world-famous 'show place of the deep,' is 16 feet deep and 80 feet in diameter. It holds 555,000 gallons of water with a circulation of 4,300 gallons per minute. There is a current of approximately one mile per hour at the bottom of the tank.

A large drain is in the centre of the tank and the water goes through the drain and returns to the filter plant to be filtered and re-circulated.

Divers are 'charing' in the tank. They clean it regularly using a suction vacuum, that is made especially for this type of work. The suction vacuum has an eight feet handle attachment.

The vacuuming job requires approximately eight hours. This operation is necessary, at least, once a week mainly to eliminate the growth of algae on the floor of the tank.

Water for the main tank is drawn from Biscayne Bay and pumped into a large filter plant, where it is filtered and pumped into the main tank.

The main tank is built on a three storey level with a continuous band of glass encircling the tank which constitutes approximately 128 viewing windows.

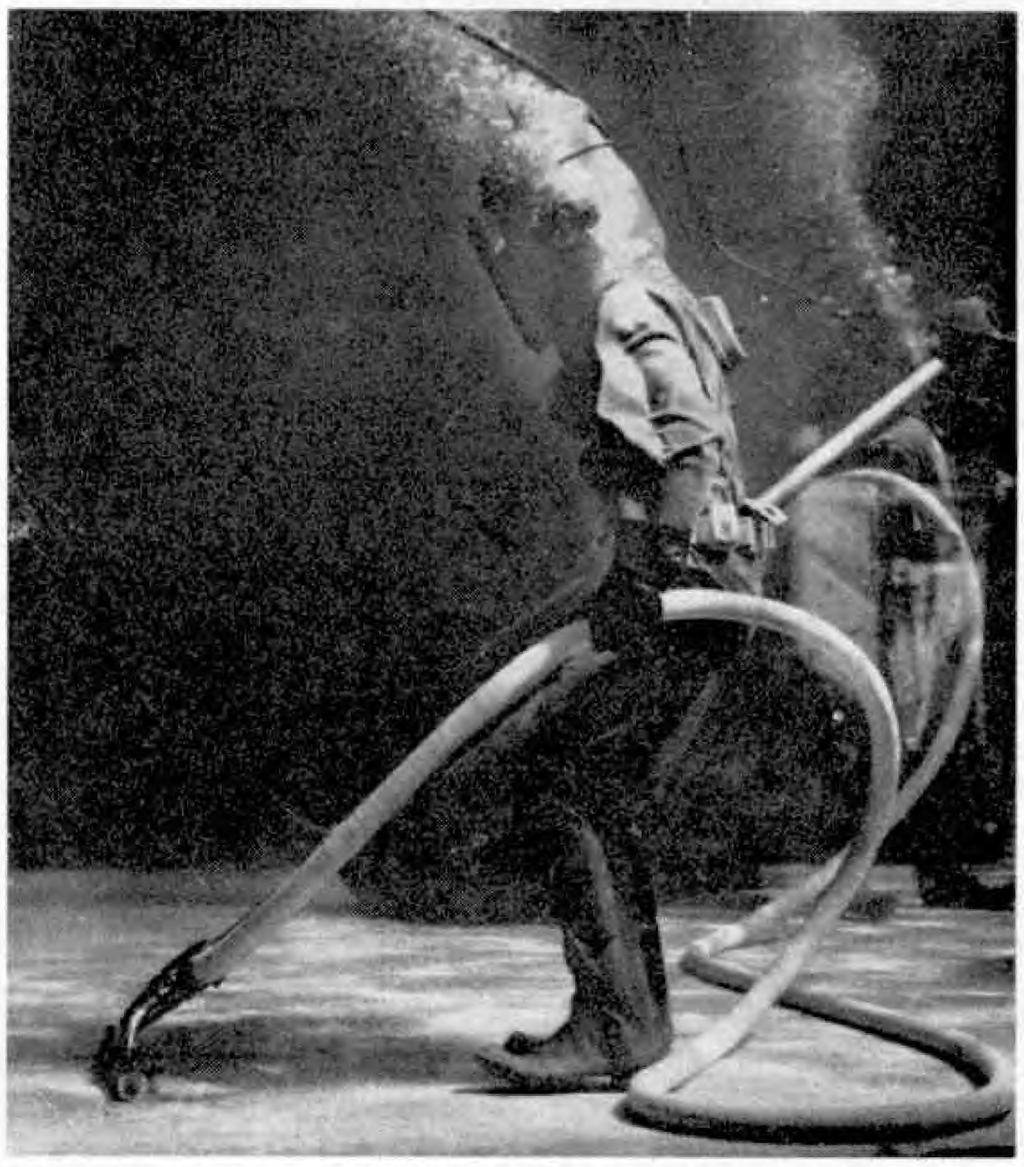
In order to control the growth of algae on the windows, the driver scrubs them with bronze wool pads, which necessitates the use of, at least, ten pads per cleaning. This takes about three hours as algae grows rapidly on the floors and walls of the sea water tanks.

Besides the natural hazards of the job—fun-loving porpoises often get tangled in the air hose—knees get rubbed as the divers kneel down to clean the lower layer of windows and feet get tired as they fight the simulated ocean currents. Rubber gloves aren't suffiient protection against coral scratches and nips by hungry sea turtles.

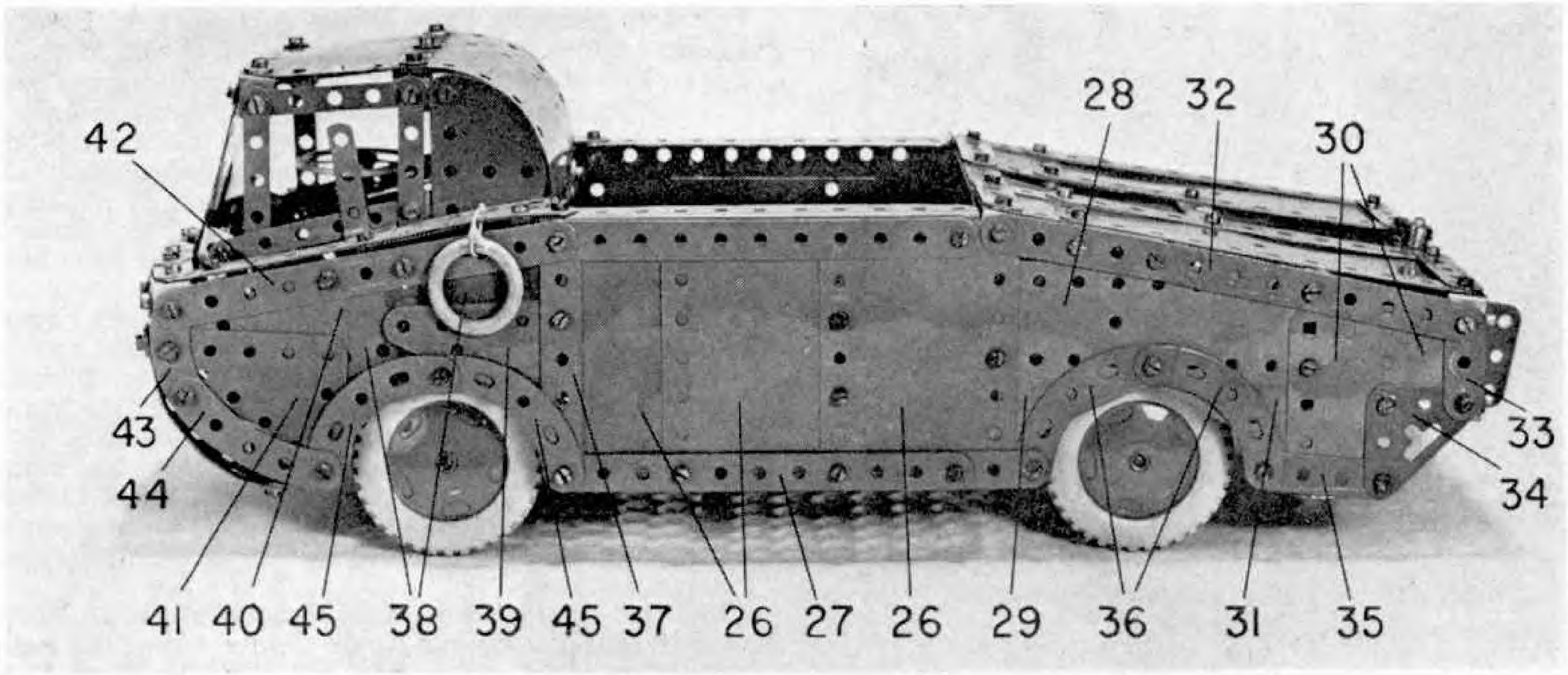
It takes steady nerves and extra-strong hands to tackle giant sharks, playful porpoises, 450-pound sea turtles, whip rays, and, in the meantime, avoid slithery moray eels, and a number of other 'beasts of the deep.'

Vacuuming calls for cool nerves and the diver pauses as a huge tiger shark swims by.





It's a slow job cleaning the floor of the tank. Fancy having to wear all that gear just to operate a vacuum cleaner!



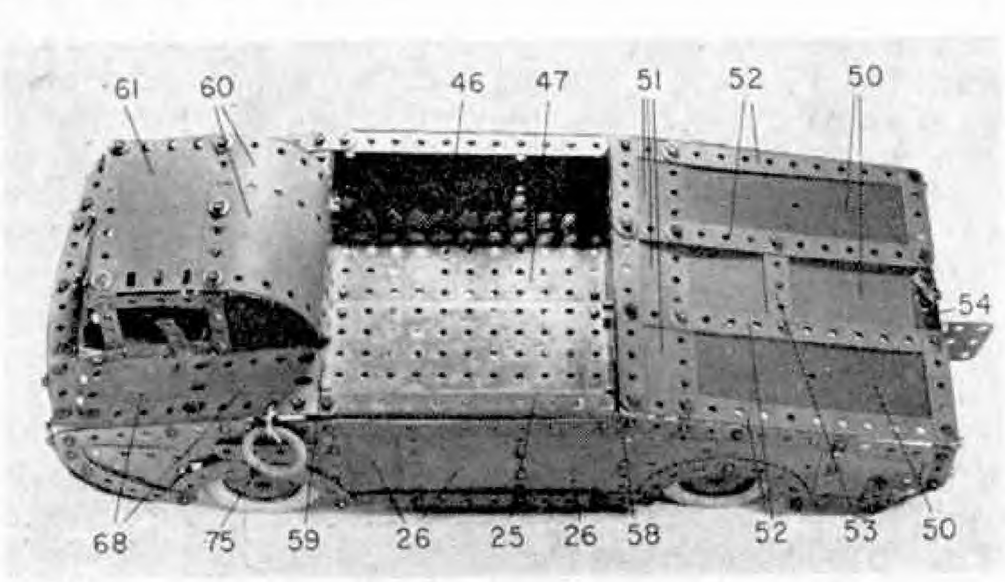
AMPHIBIAN IN MECCANO

Described by "Spanner"

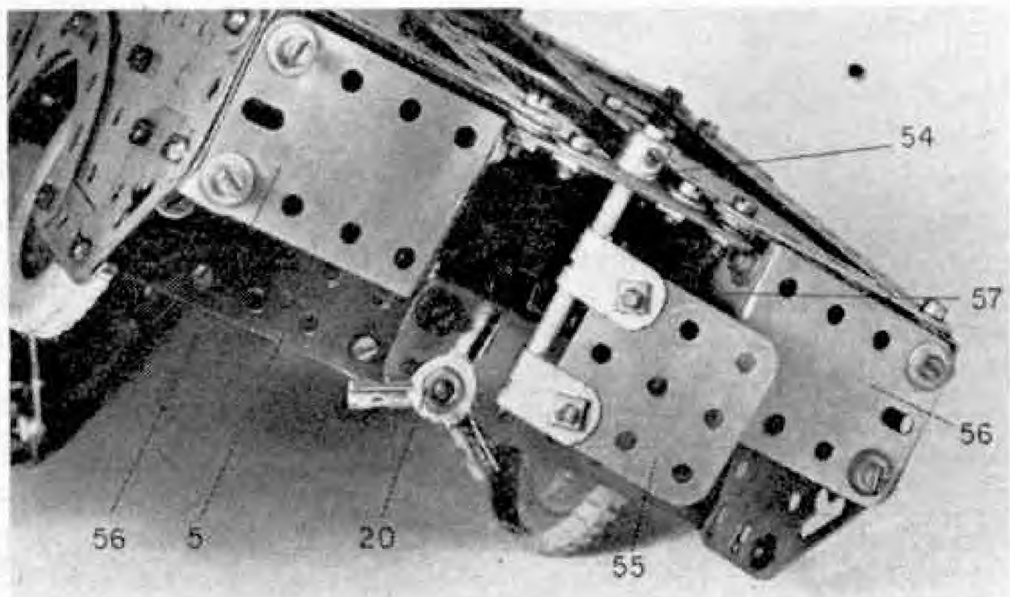
MILITARY TACTICS, in Britain, rely to a large extent on mobility. Britain, compared to countries such as the United States and Russia, does not keep a hugh army in combat readiness, but rather relies on a smaller, highly mobile force, able to travel to anywhere in the world quickly and, once there, to cover its area of operations rapidly. To enable it to do this, the army is well equipped with all sorts of specialised vehicles, and one such vehicle that has proved invaluable in watery terrain is the amphibian. An amphibian, in the military sense, is a vehicle capable of travelling on land or water and featured here is a Meccano model designed to represent an amphibious truck of the sort likely to be of use to the army. Being made of Meccano, it will not of course float, but it travels very well on land, powered by a Meccano Power Drive Unit.

Construction, as usual, begins with the chassis. Two 12½ in. Angle Girders 1 are joined together at the rear by a 5½ in. Angle Girder 2 and, at the front, by another 5½ in. Angle Girder 3, the securing Bolts in the latter case helping to fix a 5½ × 3½ in. Flat Plate 4 in place, this Plate projecting three holes in front of the Girders. Two 6½ in. compound flat girders 5, each built up from two 3½ in. Flat Girders, are bolted one to the vertical flange of Girder 2 and the other to the vertical flange of Girder 3, as shown.

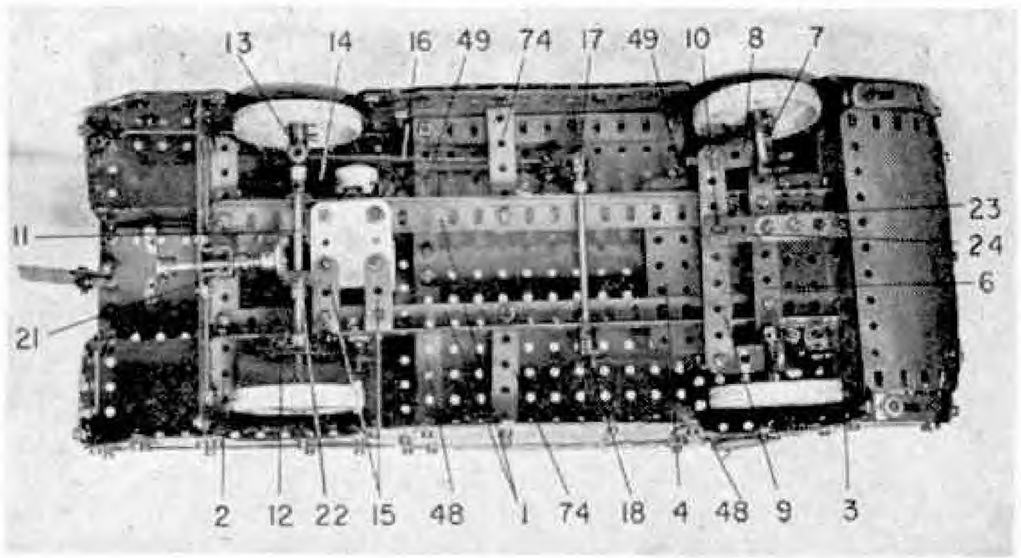
Now secured between Girders 1 through their fourth holes is a 2½ × ½ in. Double Angle Strip, to which a 4½ in. Strip 6 is bolted. Lock-nutted to each end of this Strip is a Double Bracket 7, between the lugs of which a 1½ in. Strip 8 is fixed. Journalled in the lugs of the Double Bracket is a 1½ in. Rod held in place by a Collar and a 2½ in. Road Wheel, while a 4½ in. Strip



An "aerial" view of the model showing construction of the load area and rear body top.



In this close-up view of the back of the model, the assembly of the rudder and propeller is clearly shown.



An underside view of the Amphibian showing construction of the chassis, drive and steering systems.

9 is lock-nutted between Strips 8 at each side. Fixed to Strip 9 in the position shown is a Threaded Pin 10.

Bolted in the vertical flanges of Girders 1 through their fourth holes from the rear ends are two Fish-plates, in the free holes of which a 5½ in. Rod 11 is journalled, being held by a Collar and a 1½ in. Pulley 12. Another Collar is mounted on the Rod, towards its right-hand end, followed by a Coupling 13, a spacing Washer and a 2½ in. Road Wheel, a similar Road Wheel being fixed on the left-hand end of the Rod. Note that the Coupling is free on the Rod, the Rod passing through the centre transverse bore of the Coupling. Fixed in the upper longitudinal bore of the Coupling is a 1½ in. Rod on which a Collar and a Threaded Coupling is secured, the latter on the upper end of the Rod. Bolted, in turn, to the upper end of the Threaded Coupling is a Formed Slotted Strip 14 which engages with the reversing lever of a Power Drive Unit secured to two 1½ in. Strips 15 attached by Angle Brackets to the vertical flanges of left-hand Girder 1. The Unit is also secured to the horizontal flange of right-hand Girder 1 by ¾ in. Bolts. A 1 in. Pulley on the output shaft of the Unit is connected to a Pulley 12 by a 6 in. Driving Band.

Pivotally attached to the Collar on the Rod held in Coupling 13 is a 5½ in. Narrow Strip 16, the other end of which is lock-nutted to the arm of a Crank 17 fixed on a 4 in. Rod, held by a Collar and a Double Arm Crank 18 in Girders 1. Lock-nutted to the Double Arm Crank is another 5½ in. Narrow Strip, the opposite end of which is, in turn, lock-nutted to a 3½ in. Narrow Strip 19 which is itself lock-nutted to an Angle Bracket bolted to Flat Plate 4.

At the rear of the chassis, an imitation propeller for water-borne work is provided by a 3-way Rod Connector 20, fixed on a 2½ in. Rod journalled in rear compound flat girder 5 and in a Double Bent Strip 21 bolted to the flat girder, a Collar holding it in place. A ¾ in. Contrate Wheel mounted on the inside end of the Rod meshes with a ½ in. Pinion 22 fixed on Rod 11.

At the front of the chassis, the steering system is completed by a 1¾ in. Steering Wheel mounted on a 3½ in. Rod held by a Collar in Flat Plate 4 and in a Double Bent Strip bolted to the top of the Plate. Fixed on the lower end of the Rod is a Crank 23, extended by a 1½ in. Strip which is, itself, extended by a 2 in. Slotted Strip 24. The slot in this latter Strip engages with Threaded Pin 10.

Coming to the body, each identical side is built up from a 5½ in. Angle Girder 25, to which are bolted three 3½ × 2½ in. Flexible Plates 26 overlaid at the top by a 5½ in. Strip and at the bottom by a 6½ in. compound strip 27, built up from two 5½ in. Strips. Bolted to rearmost Plate 26 are a 5½ × 1½ in. Flexible Plate 28 and a 2½ × 1½ in. Triangular Flexible Plate 29, the former extended by two 2½ × 1½ in. Flexible Plates 30, positioned as shown, and the latter extended by a second 2½ × 1½ in. Triangular Flexible Plate 31. Rigid edging is supplied by a 6½ in. compound strip 32, consisting of a 5½ in. Strip extended by a 2½ in. Strip, a 1½ in. Strip 33, a 1½ in. Corner Bracket 34 and a 2 in. Strip 35, the rear wheel arch being completed by two 2½ in. Stepped Curved Strips 36.

Bolted between the forward ends of the Strips edging Plates 26 is a 3½ in. Strip 37, then the forward section of the body is completed by two 2½ × 1½ in. Flexible Plates 38, two 2½ × 1½ in. Triangular Flexible Plates 39 and 40 and a 2½ × 2 in. Triangular Flexible Plate 41. Rigid edging is again added, in this case being supplied by a 5½ in. Strip 42, a 2½ in. Stepped Curved Strip 43 and a 2½ in. Curved Strip 44, the wheel arches again being enclosed by two 2½ in. Stepped Curved Strips 45.

Secured to the inside of each set of Plates 26, three holes down, is a 5½ in. Angle Girder 46, to the horizontal flanges of which a 5½ × 3½ in. Flat Plate 47 is bolted, the securing Bolts, in the case of one Plate, also fixing two 3½ in. Angle Girders 48, one to each end of Girder 46, and, in the case of the other Plate, fixing two 3 in. Angle Girders 49 to Girder 46. Plates 47 at each side are bolted together.

The rear top section of the body is enclosed by three 5½ × 2½ in. Flexible Plates 50 and three 2½ × 1½ in. Flexible Plates 51, all secured to a framework supplied by four longitudinally-mounted 6½ in. compound strips 52, the ends of which are connected together by 2½ in. Strips. Each compound strip consists of a 5½ in. Strip extended by a 2½ in. Strip. Note that the centres of the two inside compound strips are connected by a further two 2½ in. Strips 53, placed one on top of the other for extra strength.

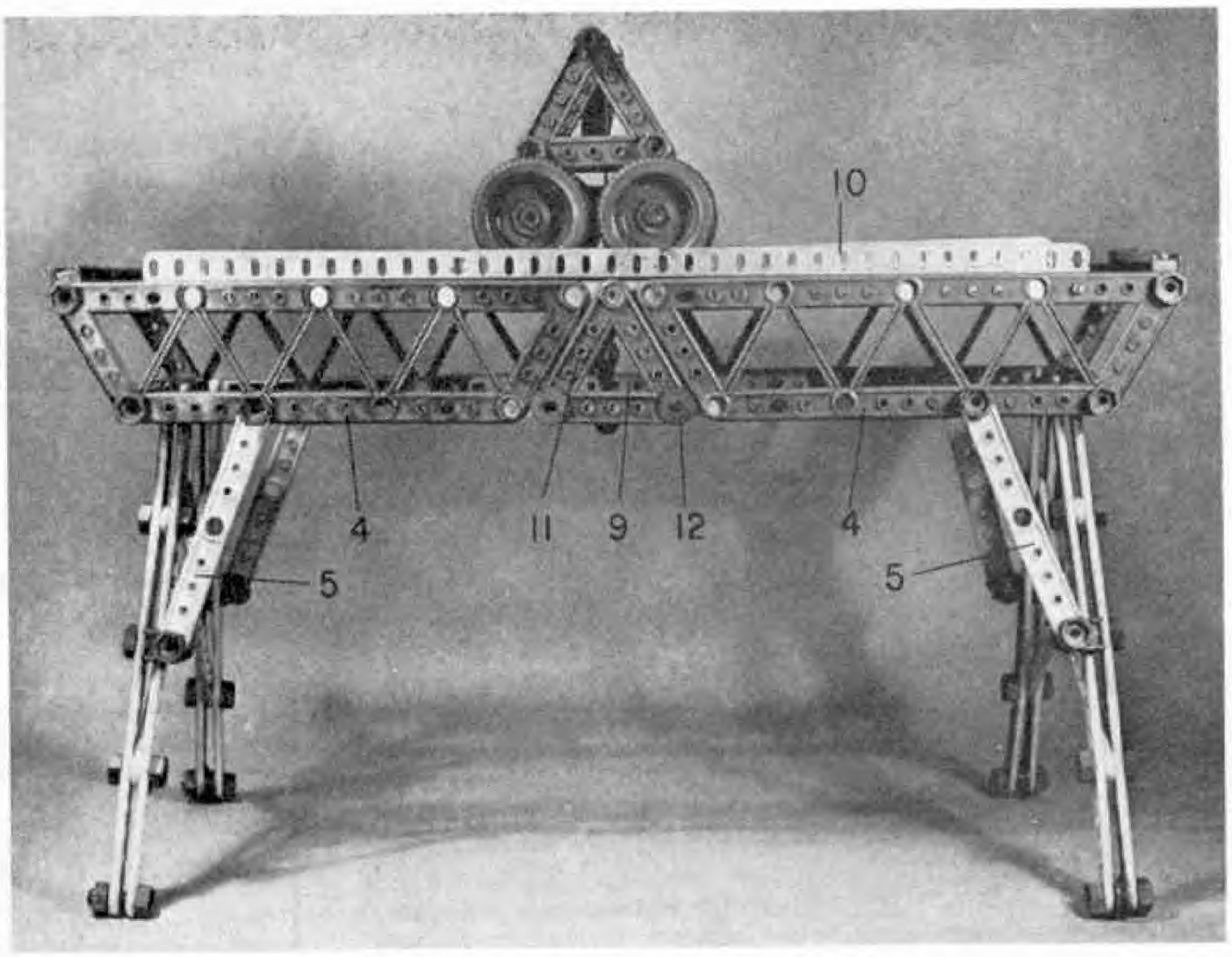
Bolted to the 2½ in. Strip joining the rear ends of inside strips 52 is a Double Arm Crank 54, in the boss of which a 2½ in. Rod is held. Mounted on this Rod are two right-angled Rod and Strip Connectors, to which a 1½ × 1½ in. Flat Plate 55 is fixed. This Flat Plate represents the rudder. The entire section is attached to the body sides by Angle Brackets, then the back of the body is built up from two 2½ × 1½ in. Flexible Plates 56, also attached by Angle Brackets, one to each side of the body. The inside end of each of the Plates is bent inwards to a right-angle and extended by another 2½ × 1½ in. Flexible Plate 57, this Plate later being attached to the chassis.

Two 5½ × 1½ in. Flexible Plates 58, overlapped nine holes, are bolted to the vertical flanges of rear Angle Girders 48 and 49, another two similar Plates 59 being bolted to forward Girders 48 and 49. Secured to the upper edges of these latter Plates are two 3½ × 2½ in. Flexible Plates 60, curved over as shown and bolted to a third 3½ × 2½ in. Flexible Plate 61, forming the cab roof, the outer securing Bolts also holding two Angle Brackets in place, one at each side. Attached to each of these Angle Brackets are a second Angle Bracket, a 4½ in. Narrow Strip 62 and a 2½ in. Narrow Strip 63. Bolted to the spare lug of the second Angle Bracket is a third Angle Bracket, to which a Semi-circular Plate 64 is fixed, while Narrow Strip 63 is bolted, along with a second 2½ in. Narrow Strip 65 and a fourth Angle Bracket, to yet another Angle Bracket secured to the respective forward corner of Flexible Plate 61. Attached to the fourth Angle Bracket at each side is the windscreen, consisting of a 3½ × 2½ in. Trans-

(Continued on page 204)

GANTRY CRANE IN PLASTIC AND METAL

A simple model described by SPANNER



A simple Gantry Crane built mainly with Plastic Meccano, but greatly strengthened by a few well-chosen metal Meccano parts.

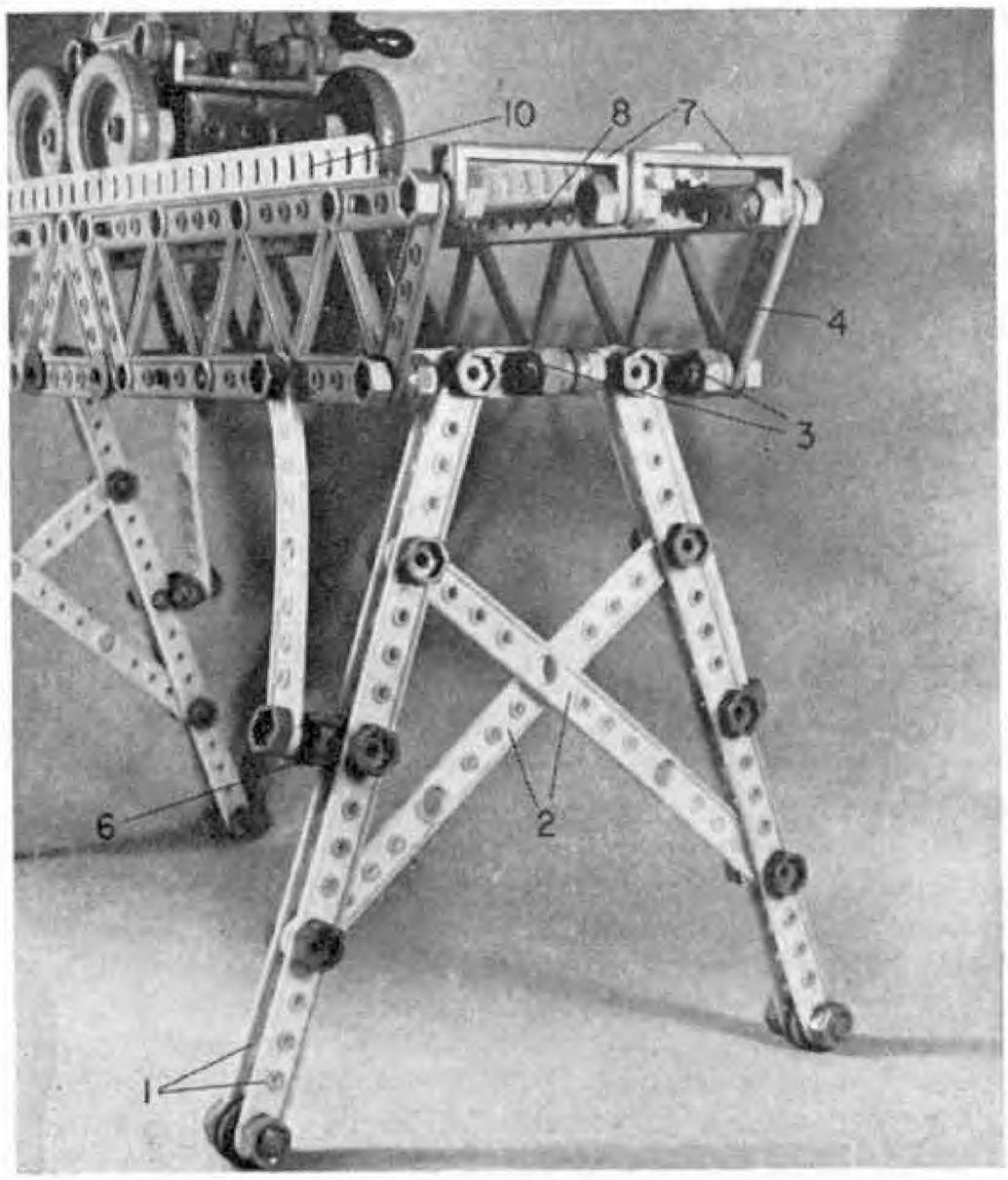
PLASTIC MECCANO is a constructional system which is obviously intended mainly for younger children, as a glance at the large, easy-to-handle parts in the system will show. It is, however, also specially designed to fit in with the more advanced metal Meccano system, for which reason the Plastic Strips and Girders, etc., in addition to their own large-diameter, widely-spaced holes, have been given small holes at the standard half-inch spacing of the metal system. As a result, by using just a few well-chosen metal parts, it is possible to turn what might be a rickety, unstable Plastic construction into a really strong and rigid model—witness the Gantry Crane featured here. Although built predominantly with Plastic Meccano, it has been greatly strengthened by the addition of only a very small number of metal parts.

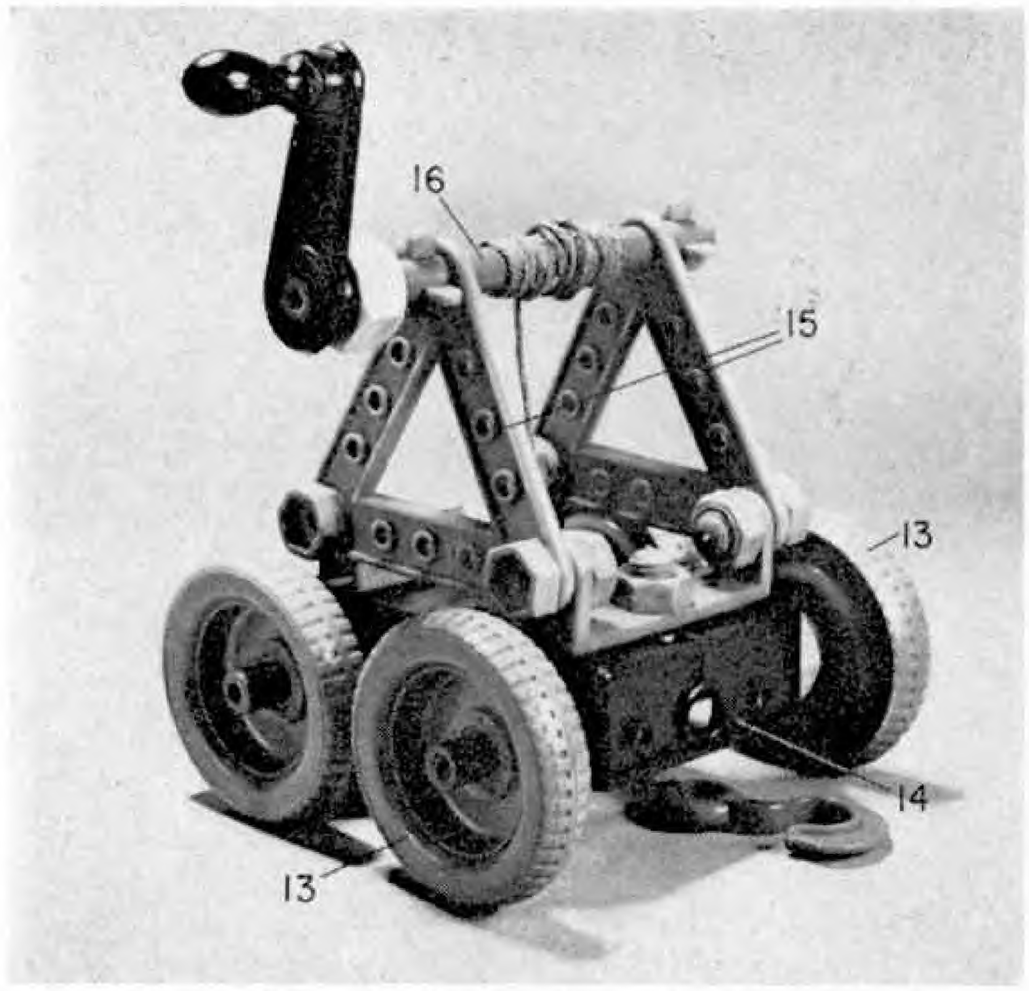
Construction is easy. Each gantry leg consists of two pairs of two 5-hole Strips 1 cross-braced by two 4-hole Strips 2 and joined together by two Double Angle Strips 3, parts 2 and 3 being sandwiched between the two Strips 1 in each pair of Strips. The inside lugs of Double Angle Strip 3 are, of course, bolted together, after which a Bridge Girder 4 is bolted to the outside lug of each Double Angle Strip. In each case, the Bridge Girder is supported by a 3-hole Strip 5, bolted between the Girder and an Angle Bracket 6 secured to the adjacent gantry leg. A Pulley Wheel is mounted on a 1 in. Bolt fixed in the lower ends of each pair of Strips 1.

The upper end corners of Bridge Girders 4 at each side are now connected by a further two Double Angle Strips 7, bolted together, then the two Girders in each section are joined to their opposite numbers by two metal 18½ in. Angle Girders 8 and two metal 7½ in. Strips 9. Another 18½ in. Angle Girder 10 is bolted, as shown, to each Angle Girder 8, while a Plastic 2-hole Triangular Girder 11 is secured to each Strip 9 to complete the actual gantry. Note that the metal Bolts fixing the Triangular Girder to the Strip pass through the large holes in the Girder and have therefore been fitted with metal ¾ in. Washers 12 to hold the Girder in place.

Runninng on Angle Girders 10 is the gantry trolly which is built entirely of Plastic Meccano. Four

In this end view of the model, construction of the gantry legs is clearly shown.





The gantry trolley is built entirely of Plastic Meccano, as is evident from this close-up view.

Road Wheels 13 are mounted on two $4\frac{1}{2}$ in. Axles, journalled in a Base 14. Bolted to the top of the Base are two Double Angle Strips, to the lugs of which two 2-hole Triangular Girders 15 are secured. Held by Axle Clips in the apex holes of these Triangular Girders is another $4\frac{1}{2}$ in. Axle 16, on one end of which a Handle is fixed. A Hook is finally tied to one end of a length of cord, this cord then being threaded through the centre hole in the top of the Base and attached to Axle 16 to serve as the winding cable.

PARTS REQUIRED

PLASTIC MECCANO

4—3-hole Strips	10—Double Angle Strips
4—4-hole Strips	4—Road Wheels
8—5-hole Strips	2—Axle Clips
1—Base	1—Hook
42—Bolts	3—$4\frac{1}{2}$ in. Axles
4—1 in. Bolts	4—2-hole Triangular Girders
42—Nuts	1—Handle
4—Angle Brackets	4—Bridge Girders

METAL MECCANO

1—1b	4—72	20—37a	4—37b
			4—38
			16 111c

AMPHIBIAN—continued from page 202

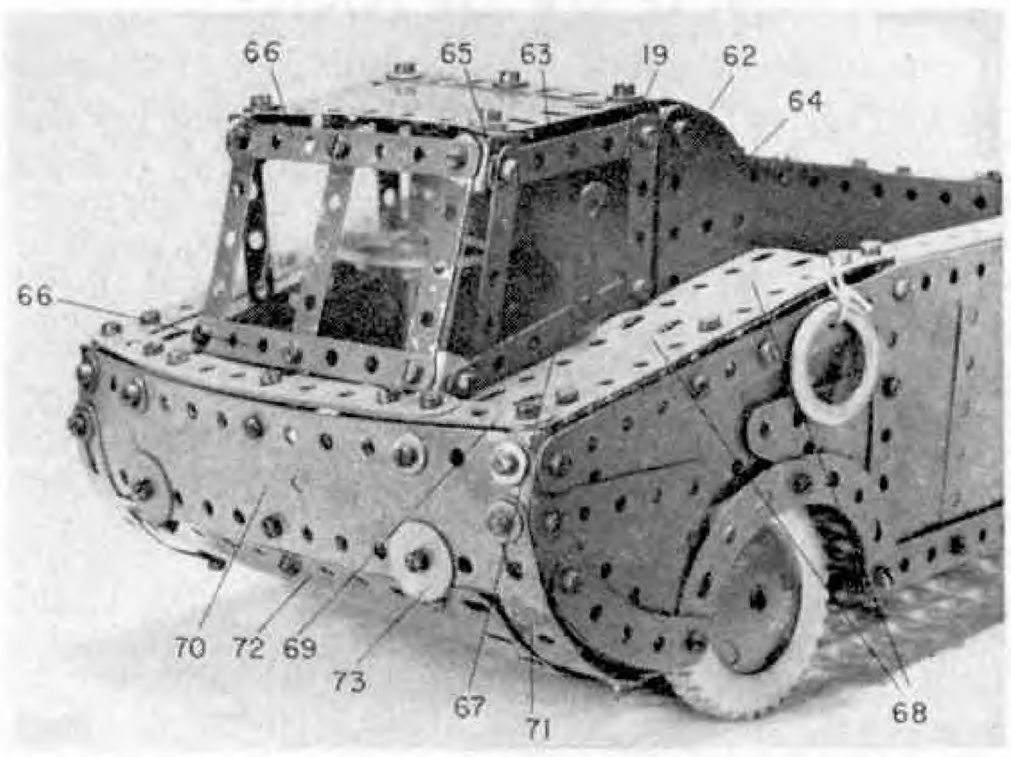
parent Plastic Plate fixed to a framework supplied by two $3\frac{1}{2}$ in. Narrow Strips 66, connected by three $2\frac{1}{2}$ in. Narrow Strips. Bolted to each lower corner of the windscreeen is an Angle Bracket, to the spare lug of which a 3 in. Narrow Strip 67 is fixed, the other end of this Strip being bolted to Narrow Strip 62.

Now bolted to the forward end of each Angle Girder 25 is a shaped $5\frac{1}{2}$ in. Strip, to which two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 68 are secured. The forward end of the Strip is attached, along with a $5\frac{1}{2}$ in. Curved Strip

PARTS REQUIRED

16—2	1—29	1—154b
2—2a	218—37a	2—155
2—3	196—37b	1—185
15—5	54—38	4—187
2—6	2—38d	17—188
7—6a	2—45	8—189
2—8	3—48a	11—190a
6—9	3—52a	4—192
2—9b	2—55a	1—194b
2—9c	33—59	2—212a
2—10	2—62	1—213b
2—11	2—62b	2—214
39—12	1—63	2—215
3—12c	1—63c	8—221
1—14a	1—74	2—222
1—15b	2—89	4—235
1—16	2—90	5—235a
2—16a	10—90a	3—235b
2—18a	2—111	2—235d
1—21	2—111c	2—235f
1—22	1—115	1—Power Drive Unit
1—26	1—154a	

69, to an Angle Bracket bolted to the upper front corner of the body side, the lattter securing Bolt holding another Angle Bracket in place. Bolted to this last Angle Bracket is a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 70, Plates 70 at each side then being overlapped nine holes and bolted together, as also are Curved Strips 69. Fixed to Plates 70, as shown, are two Formed Slotted Strips 71 and a shaped $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 72, the former bolted direct to the Plates and the latter attached by Obtuse Angle Brackets to extend the



Looking a little like a large frog, the cab and front of the Amphibian in close-up.

Plates downwards and under. A $\frac{3}{4}$ in. Washer 73 is mounted on two of the Bolts securing the Obtuse Angle Brackets to represent headlamps.

Last of all, the completed body is secured to the chassis at several places: the lower end of Formed Slotted Strips 71 and the forward front wheel arch corners are connected to forward compound flat girder 5 by Angle Brackets; the central body sides are connected to Angle Girders 1 by $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 74; the lower forward corners of Flexible Plates 57 are connected to Angle Girder 2 by a right-hand or a left-hand Corner Angle Bracket, as the case may be; the rearmost rear wheel arch corners are connected to rear compound Flat girder 5 by Angle Brackets; Narrow Strips 62 are connected to Flat Plate 4, also by Angle Brackets. When finished, the model is extremely strong, rigid and realistic, but further realism can be added by tying on a few "fenders" 75, represented by Rubber Rings. They add the final touch!

BUILDING THE CANALS

An interesting feature on our inland waterways

by J. H. TALBOT



Although past their heyday, the canals still provide transport for industry.

MY INTRODUCTION to Britain's waterways came when, as a small child on a visit to Regent's Park Zoo, I heard the distant, slow thudding of a diesel engine and saw, between the trees, brightly painted boats creeping secretly, elusively, along the nearby canal.

There was a war on. Transport was of first importance and the waterways, with their ability to move large loads reliably and economically, enjoyed an upsurge in traffic. Extra crews, many of them female, were recruited and trained and an extensive boat control system was operated in an endeavour to minimise " empty " journeys.

At the present time, on all but a few of the major waterways, commercial traffic is a shadow of its former self. Little effort is made on a national scale to stimulate the growth of water transport and Britain's 3,000-mile canal system has not been developed significantly since the turn of the century.

The manually-operated locks and the many engineering curiosities of the canals bring problems to the commercial boat operator, but for those who cruise the waterways for pleasure they offer the opportunity to study at first hand the development of civil engineering and the influence upon the growth of industry of the topography of Britain.

Whilst use has been made of natural water courses for navigational purposes since the earliest times, few attempts were made to overcome the delays and dangers brought about by alternating drought and flood. Later, some rivers were improved by construction of weirs to hold back the river's flow and maintain navigation depth. Locks were then built to enable barges to pass the weirs. Others were made navigable by means of the flash lock, or navigation weir, a crude device consisting of a single gate or other barrier which was removed to enable craft to pass upstream and was then replaced in position. When the water had increased in depth behind the gate the vessel could proceed, but this might well take an hour or more in dry weather. One lock of this type is still in regular use in Surrey at the junction of the Thames and the Wey Navigation, but it only controls about a hundred yards length of river and offers little impediment to traffic.

Some of our major rivers, notably the Trent and Severn, have always been important trading waterways; the latter was once the second busiest river in Europe. But it was the introduction of the wholly artificial waterway, the canal, which transformed the economy of England. Cornwall's china clay was conveyed to the Potteries, salt was carried from Cheshire and Worcestershire, coal became available to home and industry at half its former price and distribution of goods of all types was promoted. Not all canals were successful, but the expense and unreliability of land carriage, stemming from the woefully inadequate roads, ensured a steady dividend for those who invested their money in canal shares with a little care and foresight.

The canal engineers were the first civil engineers. Their previous experience had often been gained in totally different fields. For example James Brindley, the greatest of the pioneers, was responsible, to a greater or lesser degree, for the construction of many hundreds of miles of waterway, yet his occupation had previously been that of millwright.

The first ordnance survey map did not appear until 1801 and it was many years before the whole of the country was covered. Consequently, all of the earlier surveys had to be carried out on horseback, yard by yard, with little assistance from the inadequate and oftern inaccurate local maps. True, the surveyor's powers of observation would become sharpened with experience and he might well develop a finer " feel ' for the landscape than the modern surveyor with his mechanical aids. But surface conditions often reveal little of the geology beneath. The most comprehensive surveys (many were hurried and sketchy) were liable to error and costs escalated. Hard outcrops of rock were encountered, as on the Grand Junction Canal at Blisworth; shifting sands necessitated a brick lining for part of the bed of the Neath and Swansea Junction Canal; the summit of the Thames and Severn Canal at Sapperton, Gloucestershire leaked constantly throughout its life. The crumbling nature of the local rock completely defeated contractors working on Pensax tunnel on the Leominster Canal. This line was one of several which were never completed.



These two " narrow boats " are seventy feet long and only seven feet wide.

Many engineering problems had no precedent and it was only by inventiveness and sheer ingenuity that they could be overcome. For example, Brindley utilised the conventional pound lock on his Staffordshire and Worcestershire Canal until he built the Bratch Staircase, where a steep climb necessitated placing of locks at intervals of about ten feet, raising the difficulty of equating the volume of water released from one lock with the capacity of the very short pound above the top gate of the next. Further along the line this problem was alleviated by building " staircase " locks or " risers ", in which the lower gate of one lock and the upper gate of the next are one and the same. Similarly, when Telford built the Chirk Aquaduct, 710 feet long and 70 feet high, which carries the Llangollen Canal over the valley of the Ceiriog, he had to abandon the established technique of lining a massive stone trough with puddled clay and instead used a cast iron lining within a lighter stone structure. On the same waterway he built the famous adquaduct, Pontcysylltay, which is to the waterways enthusiast what the Great Pyramid is to the egyptologist. The navigation channel and towing path are carried in a cast iron trough, 1,007 feet long, which was assembled from numbered, interlocking sections—perhaps the first example of ' kit ' construction! There are remarkably few leaks, even after 164 years of distortion by ice and buffeting by loaded craft. An economy in weight was achieved by making the stone piers, which support the nineteen arches, hollow over a great part of their length.

Not only were errors made in surveys but in the cutting of the channel also. It is said that two gangs of men, cutting what is now the Main Line of the Grand Union Canal, met at Fenny Stratford to discover that an error in levels had been made. The result was the curious " thirteen inch " lock, situated in the middle of a long, otherwise level pound, which has frustrated the working boatman from that day to this.

In order to reduce the risk of mistakes in alignment of tunnels it was customary to cut downwards from the surface at a number of points along the proposed line of the bore and then to dig outwards in both directions from each shaft when the correct depth had been reached. Spoil would be extracted by the same means, using buckets raised by horses. Sometimes the shafts were retained for ventilation purposes when the tunnel was opened.

These access shafts also enabled water to be pumped out of the workings. Springs were often struck during such excavations: indeed it was desirable that they should, since one of the major problems in waterway management is the assurance of a reliable water supply at the highest point of a line under the driest weather conditions. A factor contributory to the downfall of a few canal companies was an inability to meet such emergency demands. A negligent boatman of the Wey and Arun Junction Canal once left a sluice drawn, drained the canal summit and suspended traffic for eight weeks, whilst the ex-skipper of a steam narrow boat recalls seeing the Grand Union Canal in such a shallow state that loaded craft travelling between the midlands and London had to be diverted via Banbury, Oxford and the Thames.

Nowadays, provision is made for pumping back lockage water at critical points in the waterways system. The reticulate waterways of Birmingham are supplied by pumping from nine shafts, but the majority of canals are fed from reservoirs, of which there are over ninety with a total capacity of 13,602 million gallons. A well known example of a canal reservoir is Welsh Harp, beside the North Circular Road in London.

Perhaps the most interesting line from a water supply viewpoint is John Rennie's Kennet and Avon Canal, which forms a major part of the inland waterway linking the Thames at Reading with the Avon at Bath. Nine miles of the bed at the Bath end were supplied by the Claverton Pumping Station, which was powered by a huge waterwheel. This wheel has been damaged by a floating tree which jammed the mechanism but restoration work is now being undertaken by students from Bath University. On the Wiltshire downs, near the village of Great Bedwyn, stands another building which once provided water for the same canal. This is the Crofton Pumping Station, a dark, gaunt building which itself stands out sharply against the rural landscape, yet is more prominent still by virtue of the truncated chimney which stands at its side. It contains two steam engines, which were installed in

Peace on the canal on a cold winter morning.



1802 and 1813 respectively. The larger machine (1813) is still in working order and was last used in 1949. It has a 42 inch bore and 8 foot stroke and lifts 223 gallons through 40 feet on every stroke at 10.2 strokes/minute.

No discussion of canal engineering would be complete without reference to the many lifts and inclined planes which were built as complements to or substitutes for long flights of locks in hilly country. All were ingenious but not all were successful.

Devon and Cornwall abounded with mechanical curiosities. The Bude Canal had no less than six inclined planes on its 35-mile line, the largest of which was 907 feet long, with a change in level of 225 feet. The boats were fitted with wheels so that they could be moved along the planes directly, without the use of wagons or caissons. The Tavistock Canal had a 237 foot drop to the River Tamar, which was scaled by a plane. The plane was powered by the Canal's induced water flow and this is now used by the Central Electricity Generating Board to drive a 26 KVA alternator at Norwellham Quay.

A venture which deserved success was the Foxton lift which, together with a second machine at Watford, Northants, was designed to enable barges to pass between London and the Leicestershire coalfield. Steam power was used to move what were in effect two counterbalanced bath tubs, each large enough to contain either one barge or two narrow boats. But the cost of maintaining a constant head of steam was higher than the traffic justified. For this reason one machine was abandoned after ten years and the other was never built, staircase locks being used instead.

Relics of these and several dozen other similar machines are dotted about the countryside still, but it is possible to inspect one working canal lift. At Anderton, Cheshire, the vertical lift designed by Sir Eric Leader Williams, raises a pair of narrow boats in each of its two caissons 50 feet from the River Weaver to the Trent and the Mersey Canal. The basic design has been adapted for use in Belgium and Canada on somewhat larger waterways.

The Manchester Ship Canal was opened in 1894 and ended the development of Britain's waterways on a grand note. Apart from improvements to the Grand Union Canal and certain river navigations, the last half-century has been a period of stagnation. In contrast, water transport in Europe has boomed. Currently, Germany is planning a new canal for the Saar, France is enlarging several existing canals, two large inclined planes have been built, 1,350 ton barges can and do cruise from the Baltic to the Mediterranean and 300 ton craft can travel to every corner of Europe.

But in the last decade a new race of navvies, or navigators, has appeared in Britain. In what has been described as the greatest social adventure of our time hundreds of ordinary people who are interested in the future of the canals both for commerce and recreational purposes are banding together and, in co-operation with the National Trust and the British Waterways Board, are re-opening moribund waterways. The 13½ mile Southern section of the Stratford-upon-Avon Canal was saved from an ignominous end by a band of enthusiasts and the example has led to similar activities on the Stourbridge, Kennet and Avon, Slough, Peak Forest and other canals. Work is now in progress, with the aid of Army Engineers and prison labour, on re-opening the navigation of Shakespeare's Avon between Stratford and Evesham. When this task is completed a route will have been re-opened between Birmingham and the Severn estuary which has been impassable for a century.



An all too familiar sight on the canals of today. This tunnel, now unused, is falling into decay.

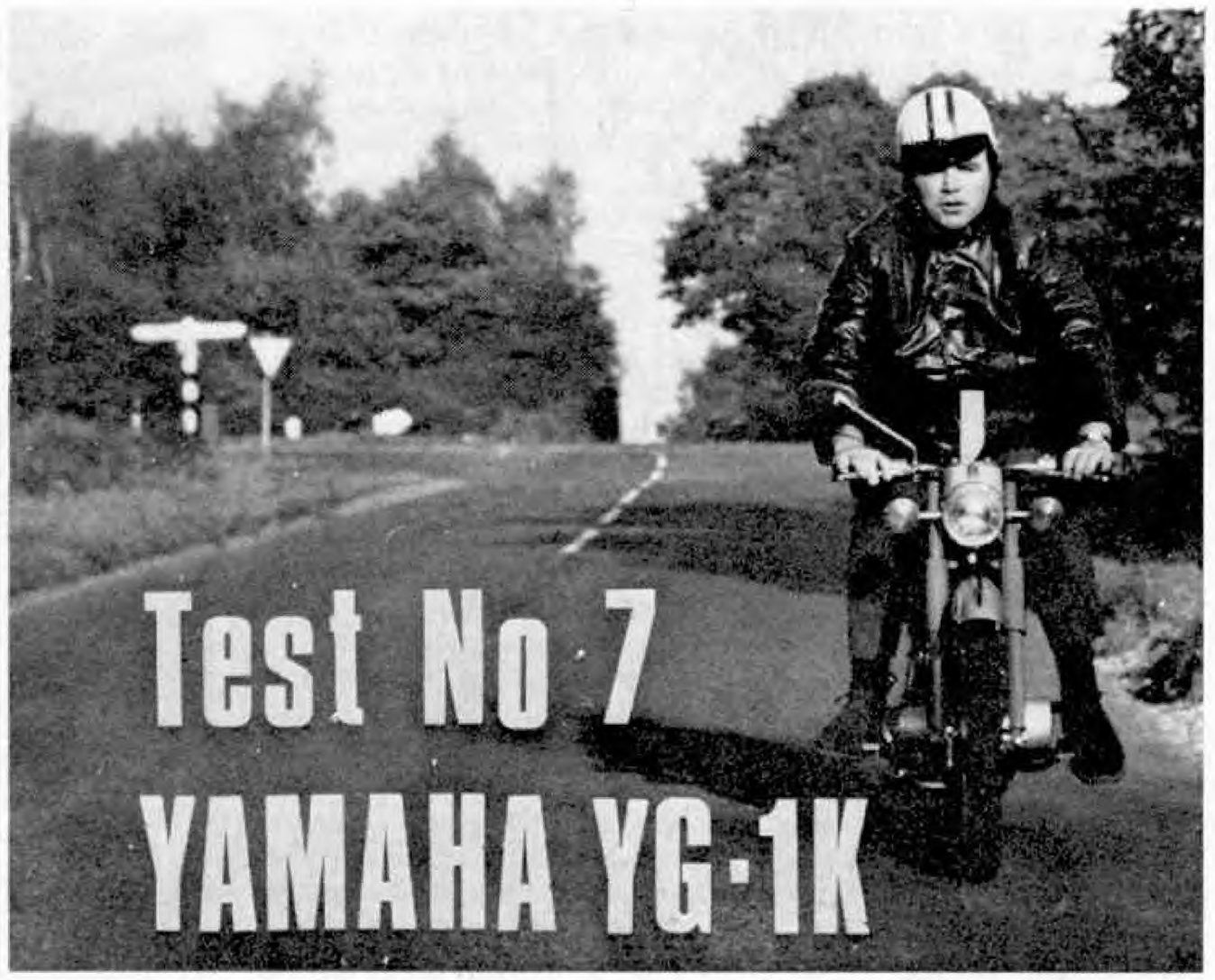
These latter-day navigators have modern instruments and machinery to aid them, but their obstacles are great. Each re-opened mile is not only a memorial to the canal builders but a tribute to the industry of the rebuilders also.

Lock gates cannot last forever, and here new frames are under construction.



ON TWO WHEELS

A lusty little lightweight from Japan . . . . .



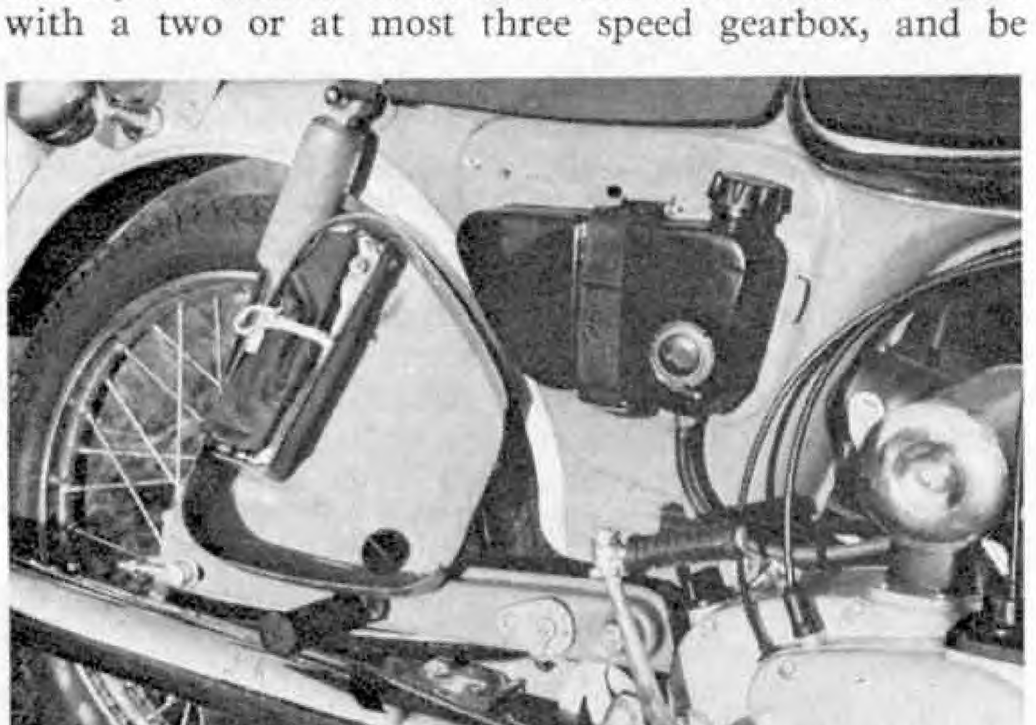
IT USED TO BE SO EASY. Ten years ago or more a motorcycle's performance could be fairly accurately guessed by its engine capacity. For instance, a machine of around 100 ccs would be fitted with a two or at most three speed gearbox, and be capable of 45 m.p.h. A 125 cc machine, three or four speeds certainly not more, would be capable of 50 to 55 m.p.h., and so on. Apart from the odd " special " there were no exceptions to the rule, and choosing a mount was simple in many ways. No fear of a similar machine or (heaven forbid) one with a *smaller* engine equalling or bettering the performance of your pride and joy, meant that any bike that passed you could be shrugged off with; " Fair enough, he's got a larger engine than mine ".

Nowadays its not so simple. Engine size bears little relationship to performance and some small bikes can out accelerate and often beat some of the larger ones, much to the annoyance of the owners of the latter ! The new Yamaha YG-IK, subject of this review, is a low capacity machine with performance regarding acceleration something which has to be seen to be believed. Its top speed (a shade over 50 m.p.h.) is not particularly high, but this is greatly offset by the remarkably short time it takes to get there !

Yamaha have been in the racing game for some years now and it is, we suppose, inevitable that it must show in their products. The YG-IK looks every inch in a lightweight racing machine, and must go on record as being one of the most eye catching bikes we have seen in a long time. The narrow flat handlebars help to create the impression of racy looks and give the rider a semi-crouched riding position. We did find that on a two hour run it tended to be a bit uncomfortable, but more upright handlebars are available.

Controls on the bars are well to hand. Clutch on the left (very smooth and light in operation) choke lever, the dip switch for the lights, and a horn button (a nice loud horn which came as a pleasant surprise !) The right-hand controls the front brake lever and flashing indicator switch.

Centrally mounted into the headlamp is the speedometer. Clear to read and well illuminated at night, it also contains the gearbox neutral indicator light, and direction indicator light. Whilst on the subject of light-



Above left. A small plastic cover when removed from the offside of the machine reveals the tool kit and oil tank. Left. A similar cover on the nearside gives access to the battery and rectifier.

ing, we would mention that this is very good, particularly the rear lamp, being both large and bright. The headlamp is good without being outstanding, and is certainly within the scope of the machines performance.

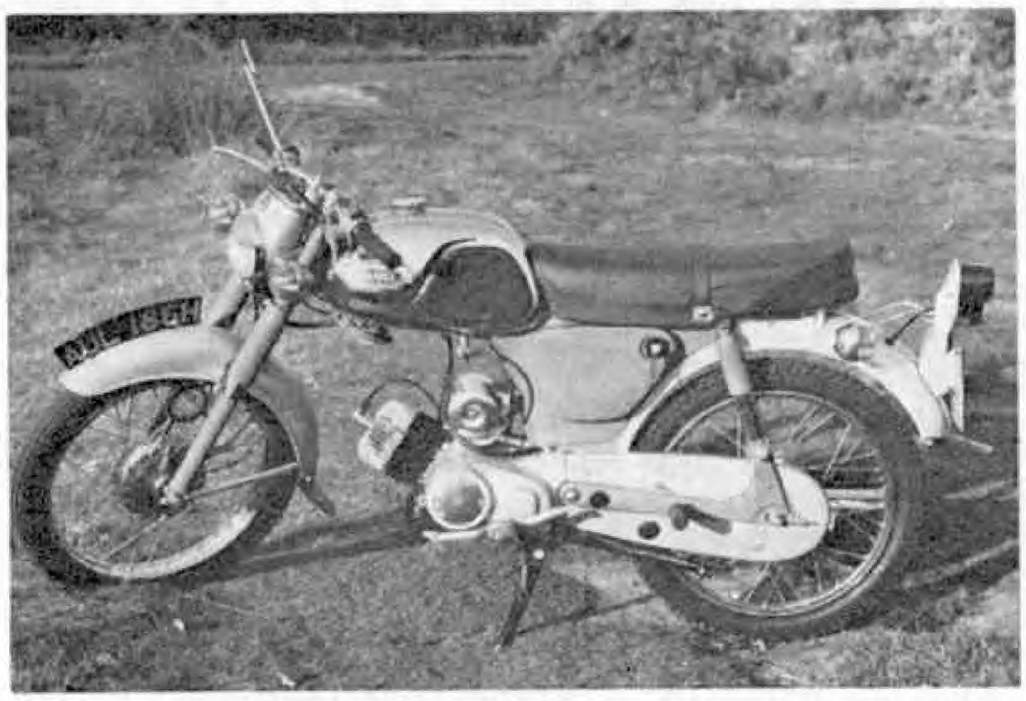
The Bodywork

The YG-IK is a very attractive machine in anybody's eyes. Paint finish is excellent, and the liberal use of polished alloy and chromium plating give it a sparkling overall appearance. Our test model was finished in brilliant red and silver, a pleasing combination. The high, narrow fuel tank holds just over 1½ gallons, enough for approximately 160 miles and includes a reserve supply. The large well padded dual-seat is very comfortable but a little on the short side for two persons, especially noticeable on a long journey when a change of position is desirable.

On either side (behind the engine unit) are removable lids giving access to, on the right the oil tank, and on the left the battery and rectifier. Situated on the right-hand lid is the ignition/lighting switch.

The Engine

Beautifully smooth, well silenced and powerful, best sum up this 73 ccs unit. Starting under all conditions was achieved at most with the second prod of the well positioned kickstart, the engine running very smoothly



even when cold. Having the choke lever on the handlebars is a sensible idea, enabling it to be progressively closed as the unit warms up, without having to remove a hand from the bars and grope blindly under the tank.

There are no vibration periods worthy of note, the engine pulls lustily, and smoothly throughout the rev. band. Silencing on the machine was without fault, quiet and rattle free. Lubrication of the unit is provided for under the "Autolube" principle. The oil is, unlike normal 2 strokes, separate from the fuel supply, being automatically fed to major points by separate mechanical means.



Above. Handlebar layout is excellent, and the accurate speedometer unit well illuminated at night. Centre left: Simple, sporty good looks sum up the appearance of this little flier.

The Gearbox

Four speeds are standard fitting on the YG-IK, operated by the "heel-and-toe" arrangement. The unit itself was very smooth and positive, enabling rapid changes to be made. Our riders complained of poor positioning of the rear lever and found changes down through the box were best made by shifting the foot completely off the footrest and operating it with the toe.

Summary

A superb little lightweight. Well designed, quiet and smooth with excellent handling and powerful brakes. Apart from the gearchange lever, we couldn't fault it, a fact that speaks well of the machine overall.

We feel it is an ideal machine for a youngster of around 16 to 18, and worthy of very serious consideration. Recommended price of the Yamaha YG-IK is £139 19s. 0d.

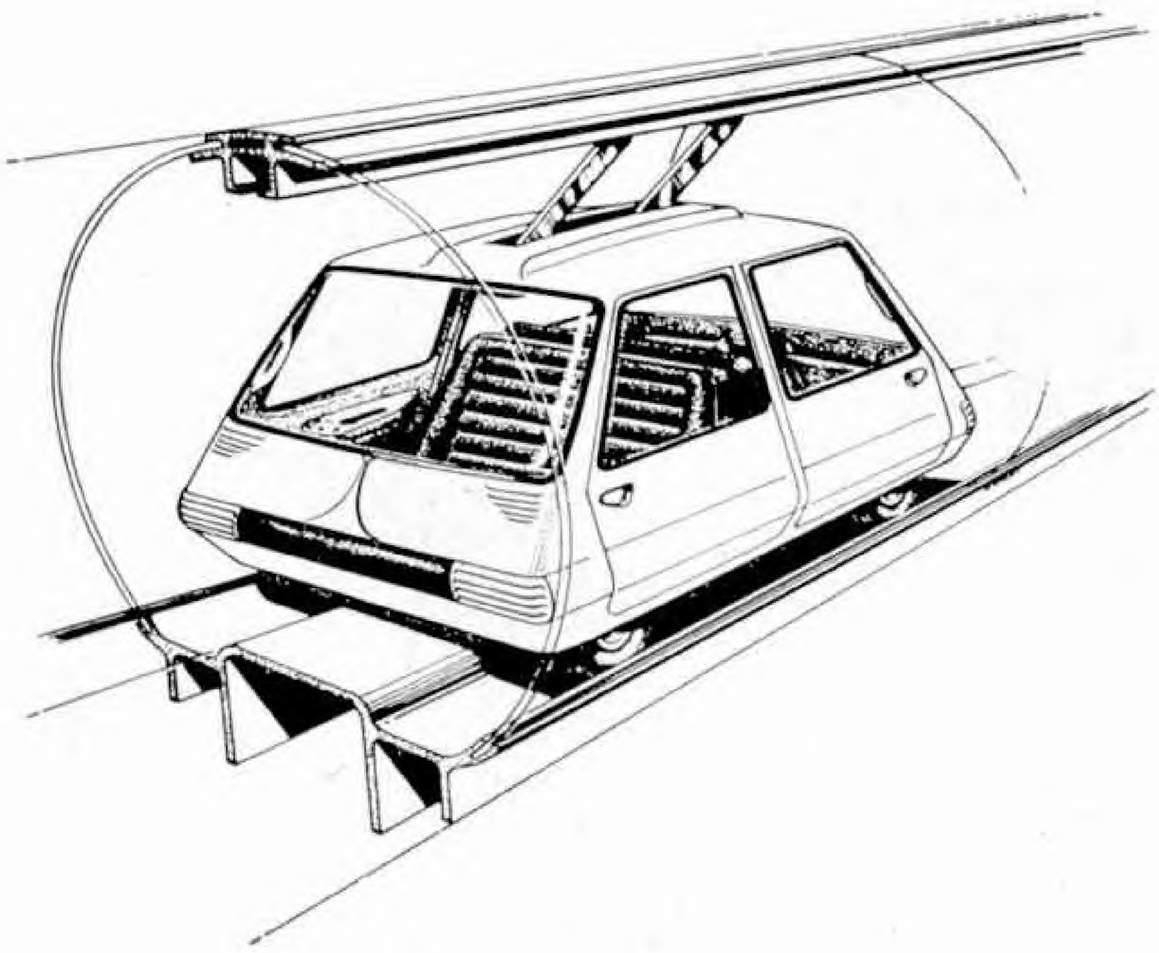
FOR THE TECHNICALLY MINDED

Cubic Capacity	73 ccs
Maximum Power	7 bhp at 7,000 r.p.m.
Consumption (per gallon)	120 miles
Weight	161 lb.
Gear Ratios	1st 28.005
	2nd 17.096
	3rd 12.108
	4th 9.084
Tyres	Front 2.50 × 17 in.
	Rear 2.50 × 17 in.
Lubrication	By separate oil tank
Common Dimensions	Length 71.5 in.
	Width 24.6 in.
	Wheelbase 45.1 in.
Available Colours	Red and Silver
	Blue and Silver





Traffic experts are developing driverless transport, so Arthur Gaunt looks at the possibilities of



ROBOT VEHICLES FOR TOMORROW

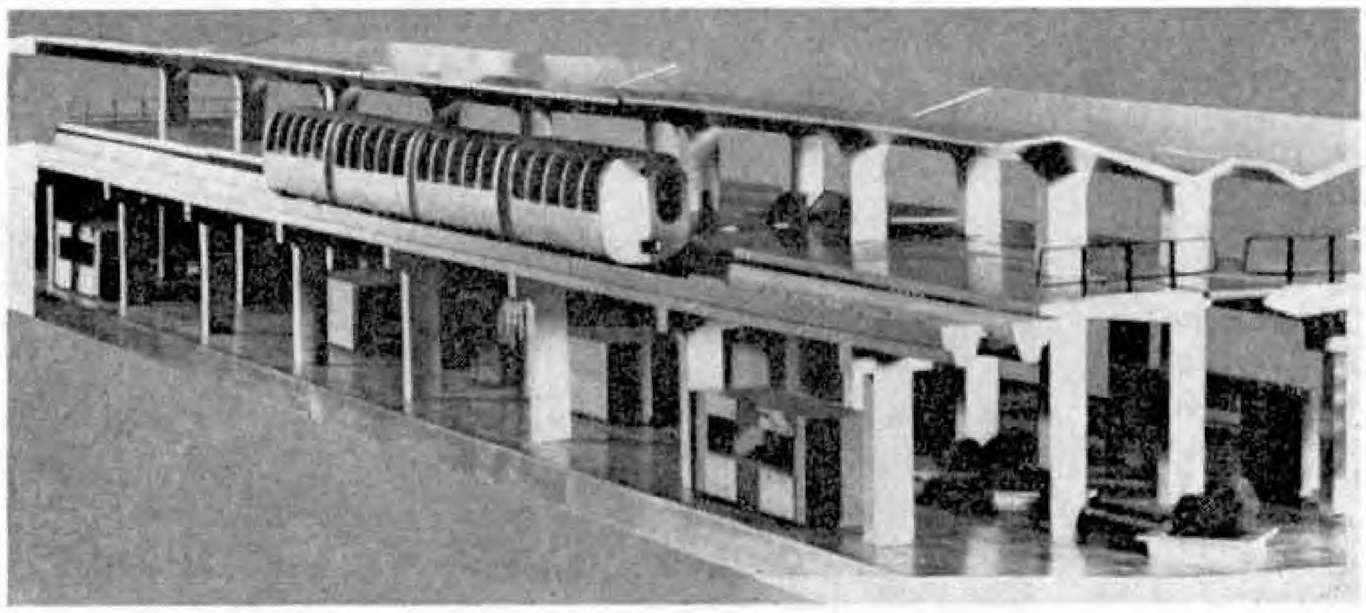
DRIVERLESS TAXICABS running around our cities and towns, and even entering large stores—that's one of the exciting ideas being examined by traffic experts today ! They are studying such systems to provide better public transport and relieve traffic congestion. Before you dismiss the scheme as impractical, declaring that many people would fear to use vehicles which have no driver, remember that thousands already use automatic transport every day. Moving stairways and unattended lifts are commonplace and are now accepted as safe and convenient.

The robot mini-train is just another stage in the development of civic transport, and is undergoing serious consideration in several countries. More than a year ago the British Ministry of Transport stated that the possibilities of developing a fully automatic self-routing passenger transport system were undergoing investigation. The idea was described and debated by engineers and traffic experts at a convention in London, and was considered perfectly feasible.

In brief, the scheme envisages an automatic service of small cars, each capable of carrying up to four adults and two children. The vehicles would require no driver, and would route themselves at 33-45 m.p.h. along a lightweight track reserved for them. They would stop only at stations, but there would be many of these, and some could be sited in existing buildings, such as big stores and post offices. The cars would be powered by 15 h.p. electric motors, taking current from overhead power lines. By making the vehicles travel at slightly different speeds they would be encouraged to bunch together, thus increasing the track capacity by forming short trains. It is estimated that each station, except those inside departmental stores and similar buildings, could handle 6,000 passengers an hour if there were two platforms.

Tickets, in the form of plastic tokens, would be issued by automatic vending machines, each ticket being shaped or punched to show the journey paid for. The passenger would insert his token into a slot in the first car to arrive at the platform before boarding, thereby actuating an electric monitor and causing the car to join the main line traffic. The runabout would proceed automatically to the station indicated by the token. At this point it would be diverted from the main line to a platform in readiness for use by other passengers for a different journey.

Controlling the whole system would be a central



Our leading photograph shows an artist's impression of a driverless four-seater car for computer controlled public passenger transport systems in congested areas.

Left: This model of the Pittsburgh crewless bus service shows what the cars and stations look like. The actual test track is one mile long.

computer, but there would be local controls for emergency use, and these would be in triplicate. Safe operation would be created by requiring passengers to make two identical signals before the cars would move away. Should one of the vehicles fail, or even slow down appreciably and interfere with the other cars, all those in the particular section would come to a stop. The ones elsewhere in the system would be routed automatically to the nearest station.

An experimental, full-scale layout of this sort has been built near Pittsburgh, U.S.A. To test public reaction and show people how the system would work if it were adopted for general city transport, Pittsburgh inhabitants have been invited to make trial trips. The aim is eventually to link the city suburbs with the city centre by a 50 m.p.h. service of crewless " sky buses." The focal point of the system will be the city transport headquarters. Here a master computer will be fed with information from robot machines at the various stations. The data will reveal how many cars are needed to cope with the crowds, and the necessary number of vehicles will be automatically routed to provide the best possible service. There will be no rush for seats, because the number of passengers admitted to the platform will be limited to the number of seats in the cars waiting to be used. Even so, nobody will have to wait more than two minutes.

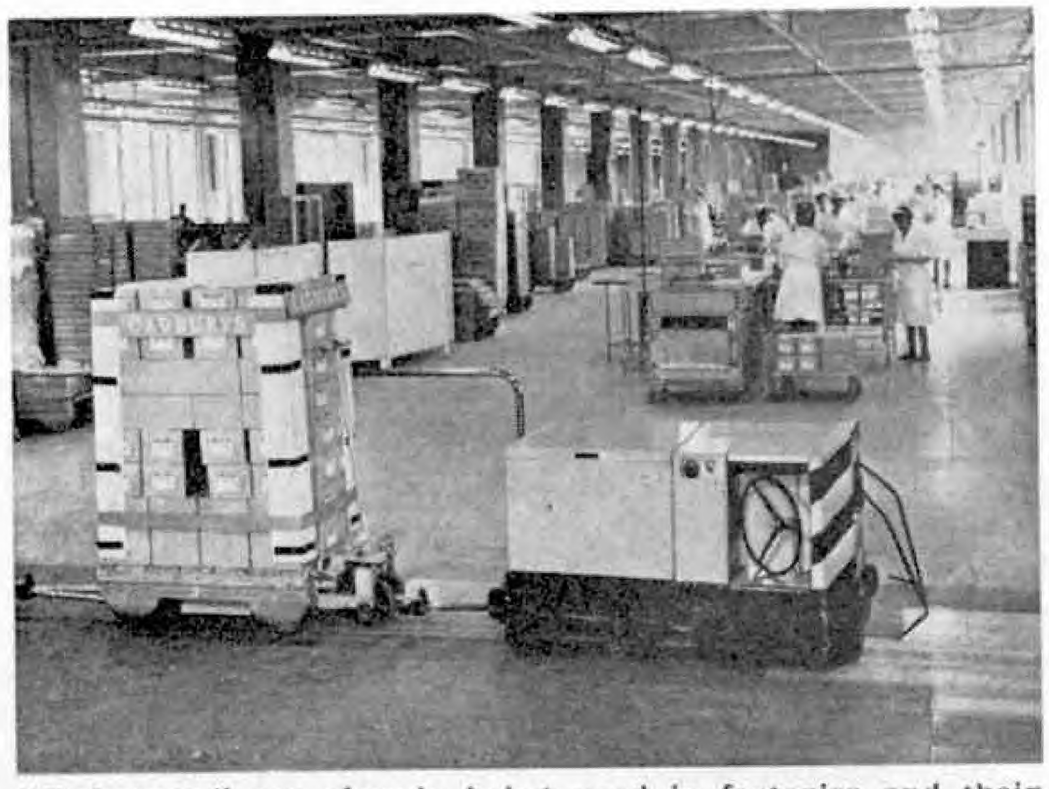
The experimental track is one mile long and has become a big attraction. The driverless and conductorless sky buses run on an overhead track constructed of precast concrete resting on piers.

The piers can be erected in the middle of motorways or alongside city streets, but the designers of the system say that it could be easily adapted to ground-level or underground use. The cars already built are 22 ft. long, 7 ft. wide and 9 ft. high, and run on rubber tyres, so that they are silent as well as comfortable. As they are powered electrically, they are fume-free and would not pollute city streets as petrol-driven buses do.

An extension of the British robot mini-taxi system is being developed at Boston, Mass. It provides for the cars to leave the track and to run as battery-operated ones with a driver. For crewless buses there are plans, both in Britain and abroad, to do away with rails. The proposal is to keep the vehicles on course by means of the magnetic field created by a buried wire. The cable is placed an inch or two underground along the prescribed route, and a small alternating current which is passed through the wire guides the cars.

Systems of this type are no longer entirely experimental. They are used to guide small vehicles, such as trucks, around factories. The trucks can be operated be remote control, commands being given to them by a stationary unit. Switches enable the vehicles to be despatched on errands, and they go uncannily but unerringly to the selected point. Pre-set controls will cause them to make intermediate stops if necessary, but as a safety precaution they are fitted with bumper bars which bring them to a halt if any obstruction is met. The trucks also come to a stop if they leave the magnetic track. The adaptation of this system to unmanned public transport seems to have promising possibilities, and its use in that way is being carefully studied.

Then there's " never-stop " transport, with cars continually moving from one station to another. They travel slowly as they pass the platforms, but pick up speed between the stations. Surprisingly the idea isn't new, and a system of this sort operated at the Wembley Exhibition of 1926. The cars were propelled by a large screw laid between the rails, this being rotated at a constant speed by electric motors. Two rollers underneath each car formed a " nut " which engaged with



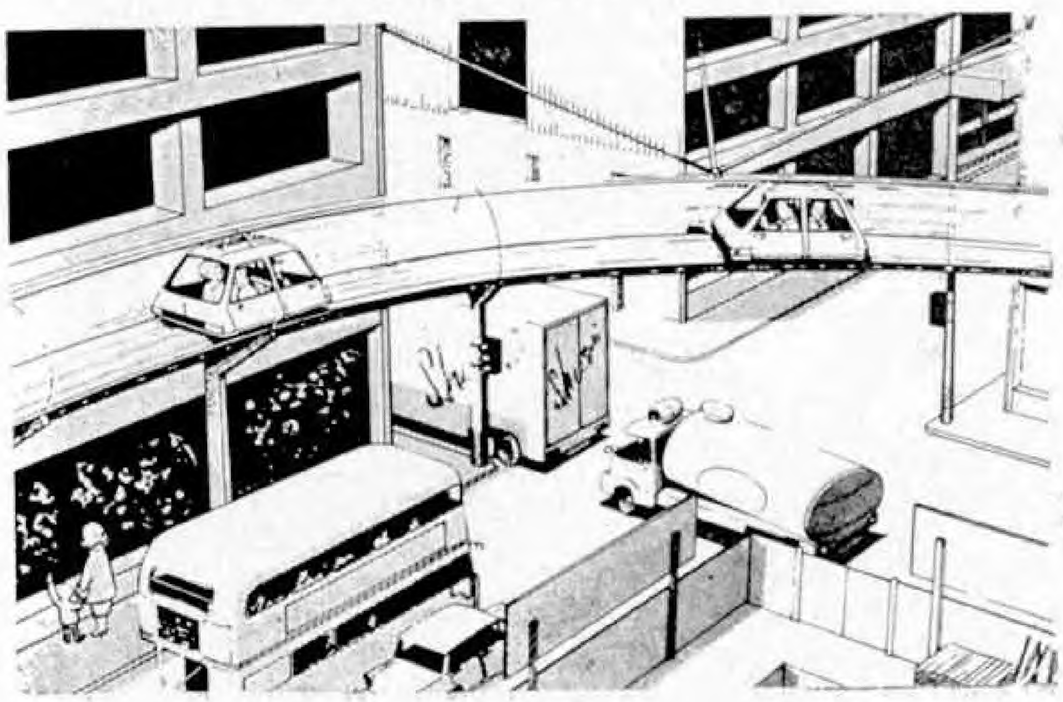
" Robotugs " are already being used in factories and their adaptation for civic transport is being considered.

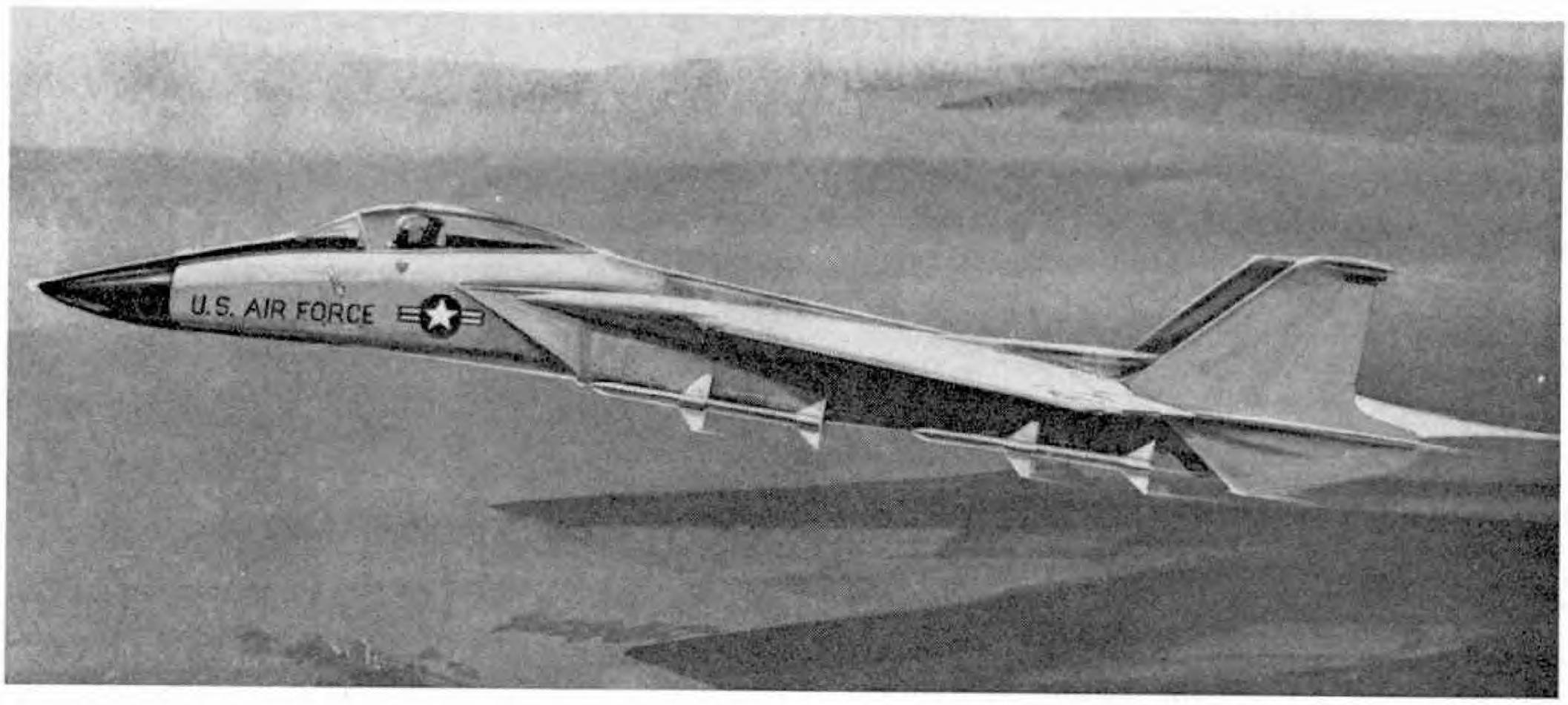
" thread " of the screw. Speed variations were obtained by having the pitch of the screw different on some sections of the route. Thus a fine pitch at stations caused the cars to travel at 1½ m.p.h., enabling passengers to board and alight without difficulty. Between stations the greater pitch of the screw increased the speed of the vehicles to 12 m.p.h.

An improved version of the system was used at the Swiss National Fair at Lausanne four years ago, and it was found to be completely safe. The maximum speed in this instance was 6½ m.p.h., with the cars slowing down to 2 m.p.h. at the stations. A refinement was that the platforms moved at the same speed as the cars at the stations, thus making it easier for passengers to get aboard or alight. For public safety the cars were operated in such a way that they entered the stations buffer-to-buffer, thus forming short trains with no gaps between the units to create a danger for passengers. Signalling and control was completely automatic, with no drivers on the trains, yet as many as 20,000 passengers an hour, it is claimed, could be carried by a never-stop mini-railway of this type.

Engineering experts today consider that robot transport for the public, in our cities and large towns, is no mere pipedream. It could become a reality within the next ten years, and transport authorities in densely populated areas foresee it as a practical proposition which will solve many of their problems.

Overhead tubes of transparent material would protect both the taxi-cars and the electrical equipment from the elements, thus ensuring a trouble-free service.





AIR NEWS

Fighters : Helicopters
Transporter : Light Aircraft

by JOHN W. R. TAYLOR



McDonnell's MiG: the next USAF Fighter

After one of the toughest design competitions ever held in America, it was announced two days before Christmas that McDonnell Douglas Corporation had been chosen to build the USAF's new F-15 single-seat fighter or service in the mid-1970's. In the last round of the contest, the McDonnell design had been matched against entries from North American Rockwell and Fairchild Hiller. It uses a swept wing similar in shape to that of the company's current F-4 Phantom II fighter; but in other respects it is very like the latest Russian MIG, known to NATO as " Foxbat ".

When " Foxbat " was first shown in public, in the 1967 air display at Domodedovo, Moscow, its twin-fin layout caused a lot of comment. Clearly, Artem Mikoyan had decided that two small fins and rudders were better than a single large and tall unit, and nobody could doubt the potential of the new fighter when it set up a series of world records, including a speed of 1,852.61 m.p.h. over a 500-km. circuit. In averaging such a speed, it was clearly capable of Mach 3 (three times the speed of sound) in level flight.

McDonnell's F-15 shares not only the twin-finned tail of the MiG, but also other features such as its side-by-side engine arrangement, inside big " trunks " with wedge air-intakes at the front. It is, however, a smaller aircraft, with the high degree of manoeuvrability that is so essential for modern air fighting. Drawings show an armament of four Sparrow air-to-air missiles

Our leading photograph shows an artist's impression of the McDonnell-Douglas F-15 fighter. Left upper: The nose section of the Douglas DC-10 is joined to the fuselage section following the latter's unloading from the Super Guppy transport aircraft (lower).



The MF1-15, a two-seater trainer recently fitted with a "T"-tail.

mounted on the air intake trunks; but the F-15 will also use a gun and new highly-manoeuvrable close-in dogfighting missiles now under development as a result of combat experience in Vietnam.

Initial contracts will cover the design and construction of 20 F-15s for development testing, at a cost of $1,146,385,000 (nearly £480 million). The first of these aircraft is expected to be completed in 1972. The first combat wing of F-15s will begin to form in 1975, with 107 production aircraft that will cost about £3,650,000 each. They are expected to have a top speed of Mach 2.5, which the USAF believes will be adequate for air defence fighters up to the mid-1980s.

Top Chopper

One of the big jobs done by U.S. Army helicopters in Vietnam has been to recover light aircraft and other helicopters that have been shot down or forced down by mechanical faults. The record for this kind of work is held by a tandem-rotor Boeing CH-478 Chinook of the 765th Aviation Battalion, 330th Transportation Company. Painted on the side of its cabin are the silhouettes of more than 400 aircraft that it has hauled back to American repair depots. Replacement value of these aircraft would exceed £42 million.

HAL puts Hull on Airways Map

By the time you read this issue of *Meccano Magazine*, Humber Airways Ltd. (HAL) should have re-opened air passenger services between Hull and London. Scheduled date for starting the operation was March 2nd, with three return flights daily between Brough, just outside Hull, and Leavesden, near Watford.

Using two ten-seat Britten-Norman Islanders of the kind that won the big BP England-Australia Air Race in December, HAL plans to cover the route in about $1\frac{3}{4}$ hours. This is half-an-hour quicker than the previous air service by Autair, abandoned last October, and about two hours faster than by rail. The single fare is £7.7.0.

Guppy Speeds DC-10

With orders and options for 201 of its new DC-10 tri-jet airbuses already received from 10 airlines, McDonnell Douglas is working flat out to complete the prototype by the Summer of this year.

Forward fuselage sections 55 ft. long and nearly 20 ft. in diameter, built by Convair at San Diego, are flown to the assembly works at Long Beach, California, on board an Aero Spacelines Super Guppy. Largest-capacity transport aircraft yet flown, the Super Guppy was built from sections of four Boeing Stratocruiser and C-97J aircraft. The original wing span was increased by 15 ft.; the fuselage was lengthened by 30 ft. 10 in. and a new upper fuselage lobe was built on top of the standard lower lobe, with an inside diameter of 25 ft. The four 7,000 h.p. Pratt & Whitney T34-P-7WA turboprops of the C-97J were retained, enabling the Super Guppy to carry payloads of up to 18 tons at 300 m.p.h.

So successful had the Super Guppy proved, mainly as a transporter for sections of the Apollo/Saturn V rocket, that Aero Spacelines are building a fleet of even bigger commercial Super Guppies and smaller Mini Guppies.

MFI-15 now has T-Tail

As can be seen in the illustration above, the MFI-15 two-seat trainer and light utility aircraft now has a T-tail instead of the low-mounted tailplane with which the prototype first flew last July. This keeps the tail clear of snow when the aircraft operates in northern latitudes in winter.

Powered by a 160 h.p. Lycoming engine, the all-metal MFI-15 is a development of the earlier 100 h.p. MFI-9 Junior/Mili-trainer family built by both MFI in Sweden and Bölkow in Germany. The MFI-9 achieved notoriety when flown from Biafra for attacks with rockets and other weapons against jet fighters and bombers of the Nigerian Air Force. This emphasises the sturdiness of the basic design. Its versatility is further increased by the ability to replace the standard tricycle undercarriage with a tail-wheel type, or skis, and to fit special flaps for operation from small airfields.

Meccano Constructors' Guide

Part 3 *(continued)*

by B. N. Love

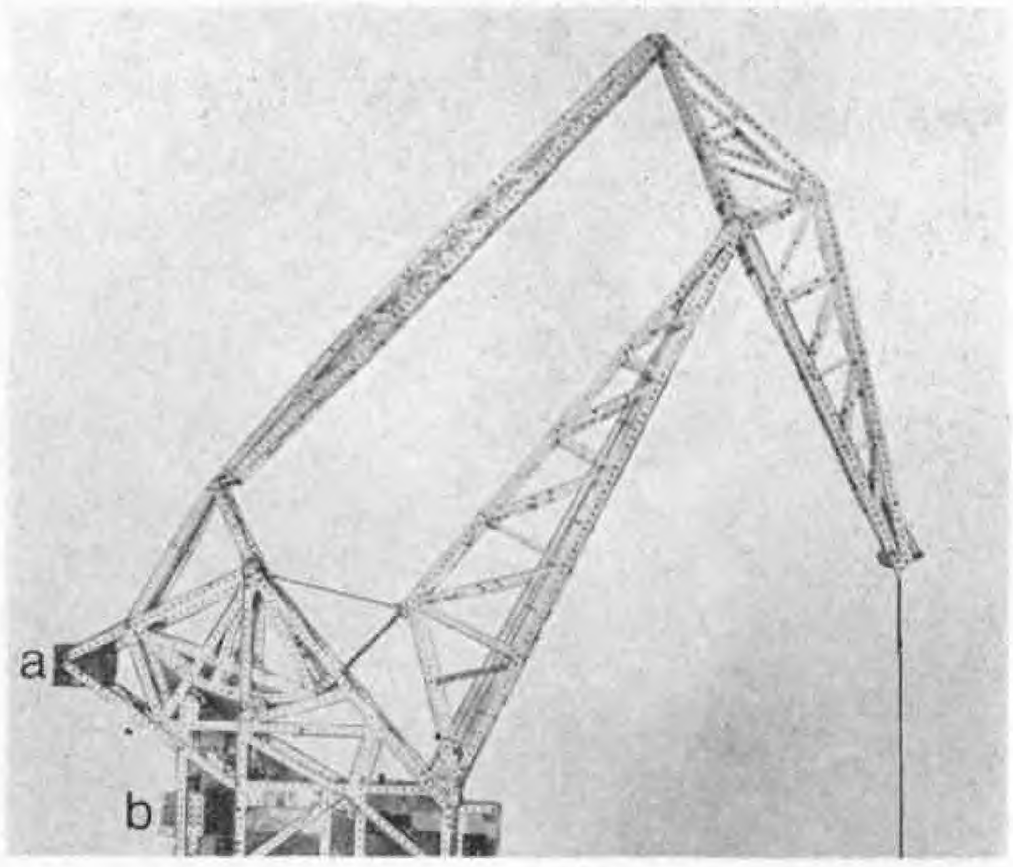
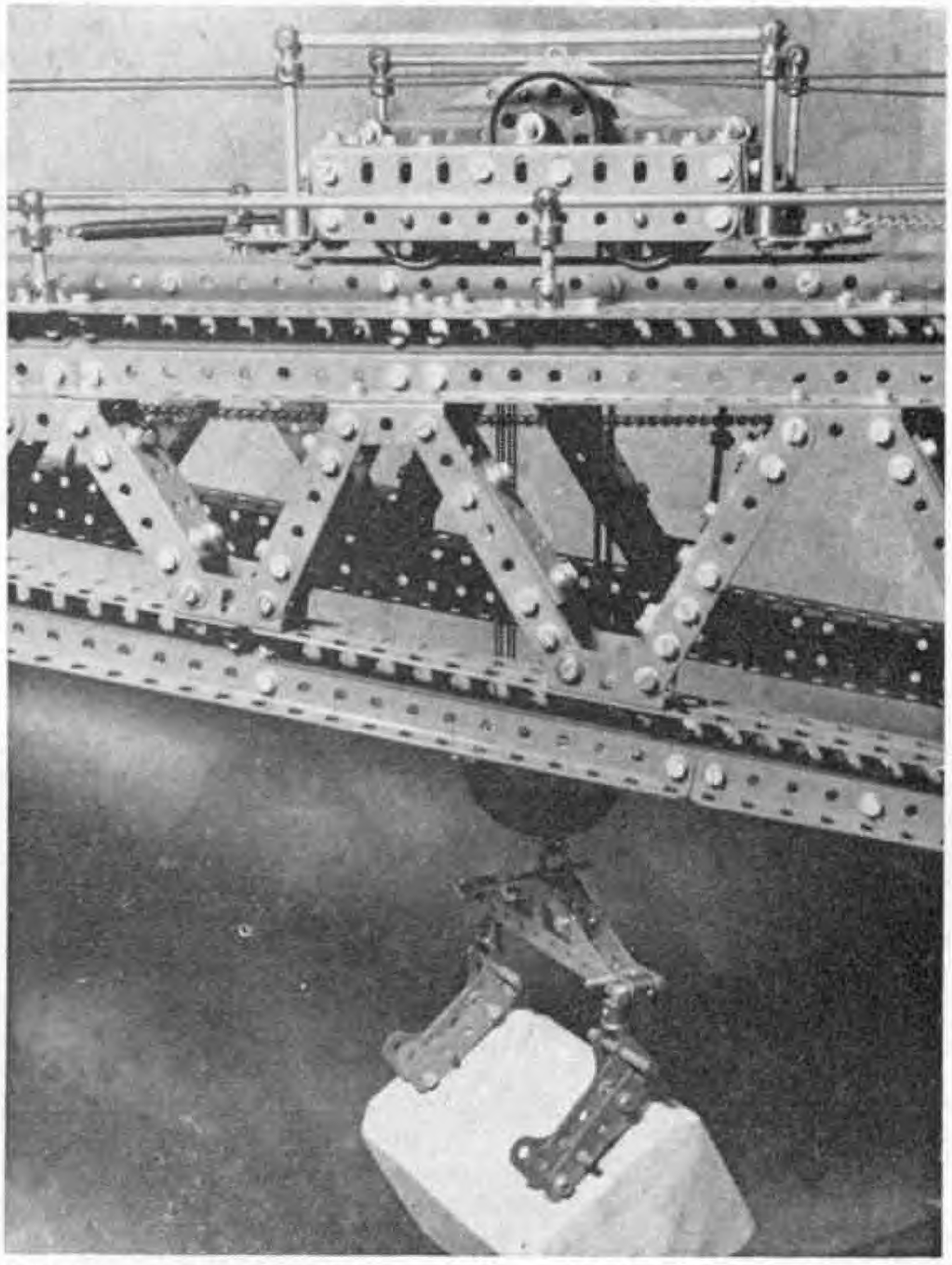


Fig. 8. The jib system of a level-luffing crane in which the linked jib method is employed. Note the parallelogram form of the geometry and the sliding counterweight at (b) which keeps the entire luffing system balanced.

Basic Crane Structures

Crane safety is a most important aspect in crane construction whether a simple pulley block or giant Hammerhead Crane is in use. Safe working loads and the inspection of all running gear, brake drums, etc., is vital, of course, but the basic design of the crane must always ensure stability and strength. However, as economy of materials and weight must always be considered, the combination of sound engineering principles must be applied to finding the compromise. The accompanying illustrations give some idea of the way in which Meccano cranes can be constructed to follow sound lines in accordance with their prototypes.



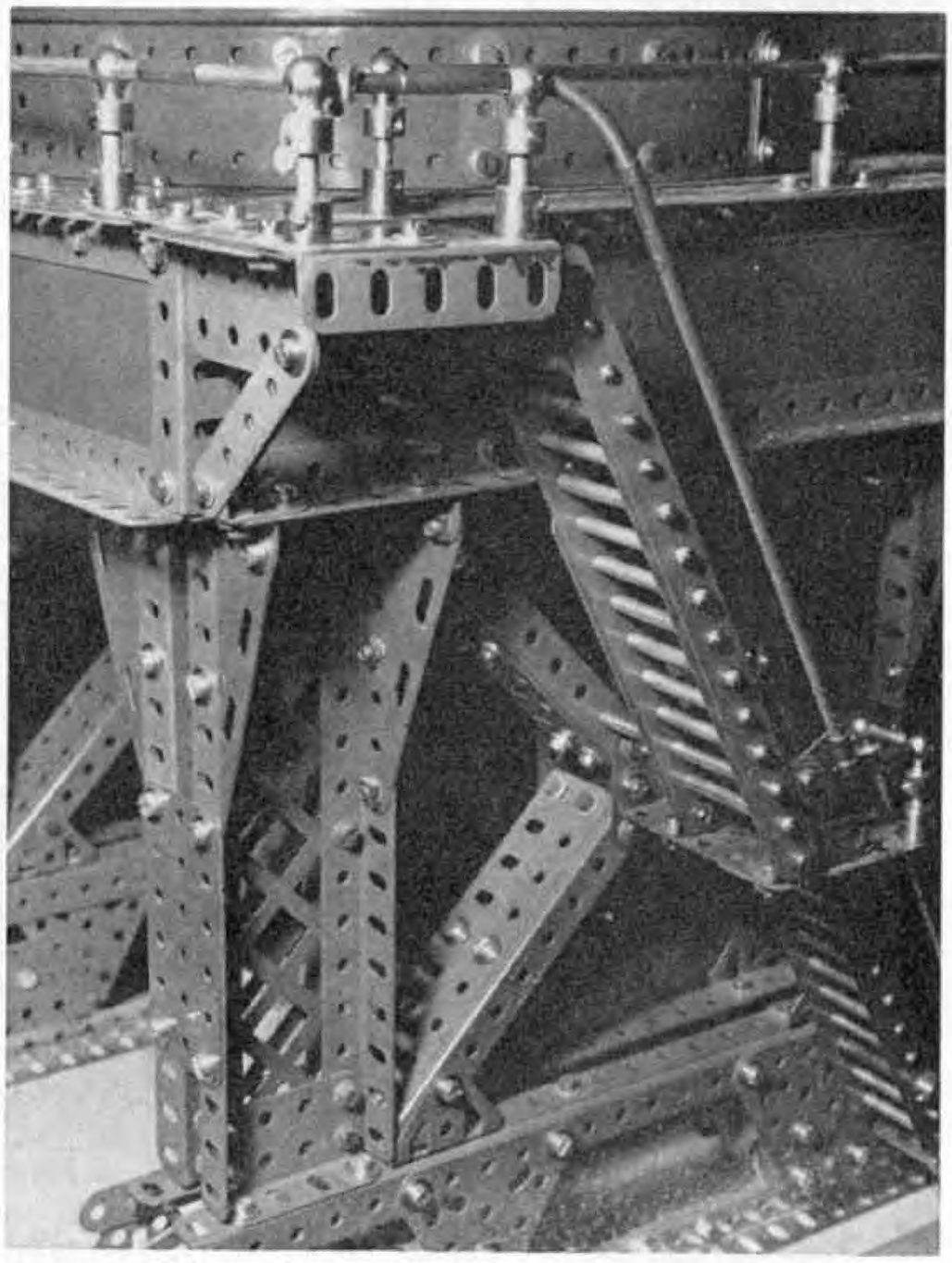


Fig. 12. Typical features of a sturdy Blocksetting Crane. Note use of Triangular Flexible Plates, in several thicknesses, to reinforce the joints of the Portal legs. The boom girders are of heavy section and carry a very robust travelling "crab" capable of supporting the weight of the stone block, etc.

Fig. 9 show a simple but very strong crane tower in which the rigidity of the corner Girders is reinforced by the bracing qualities of Perforated Strips and the use of triangulation is well exploited.

Fig. 10 shows the base of a free-standing structure for a Monotower crane in which compound girders, similar to those discussed in Chapter 1, are used to reinforce the base of the tower and to support the heel of the crane pivot post which runs down through the centre of the tower and takes the entire downward thrust of the whole crane revolving structure. As can be seen in Fig. 10, the central 'H' girder taking the thrust at the base is fitted with a pad of small Flat Plates on which a Bush Wheel is mounted and to which a Socket Coupling is attached. The heel of the pivot post carries a Bush Wheel or similar component, the boss of which enters the upper socket of the Socket Coupling for a short distance where it meets a Meccano Steel Ball resting in the upper socket. The result is a highly efficient rotary thrust bearing which permits the superstructure of the crane to be rotated with ease and a minimum of power.

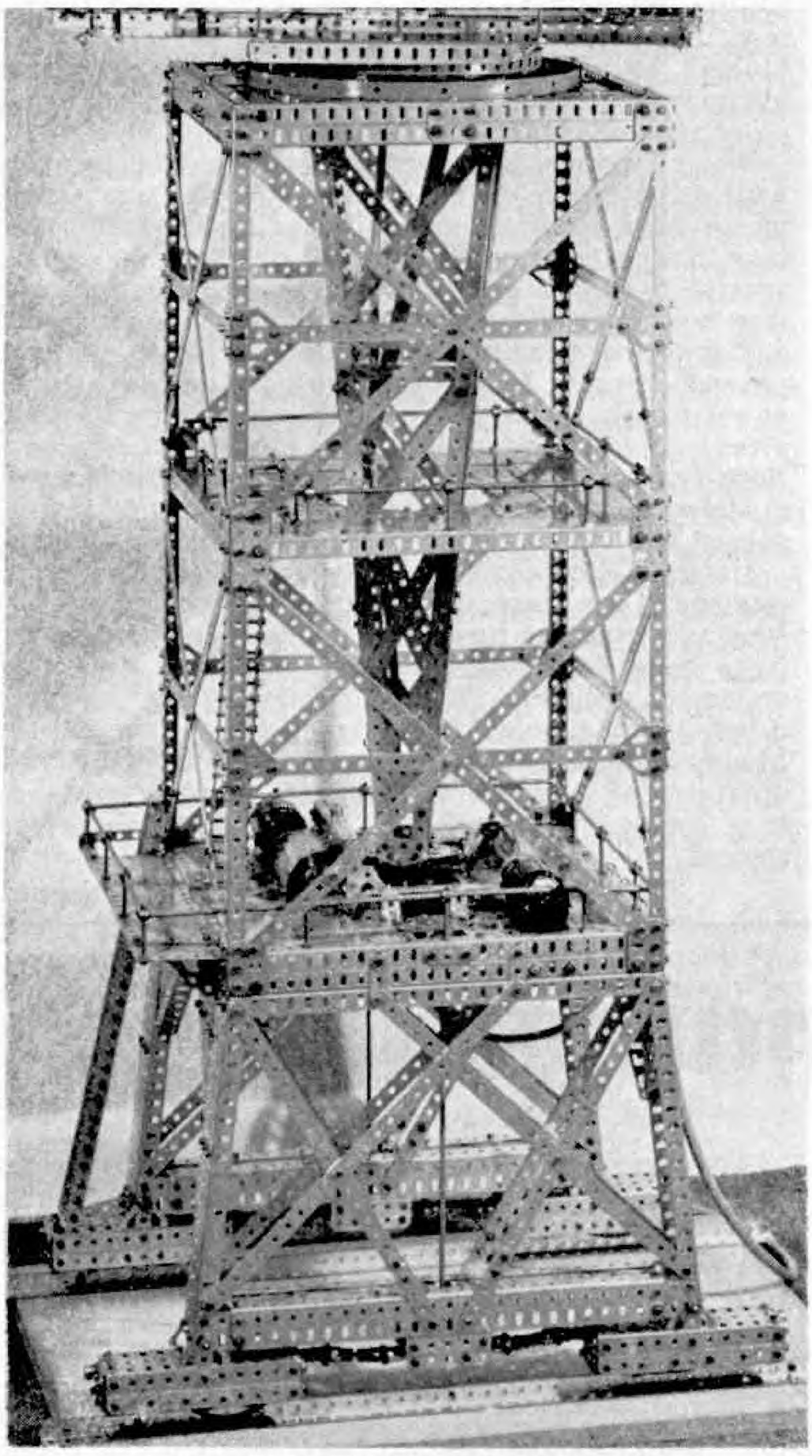


Fig. 9. A good example of an elegant, but strong tower construction for a high-reach dockside crane. Triangular bracing is well exploited as also are the rigid properties of Angle Girders.

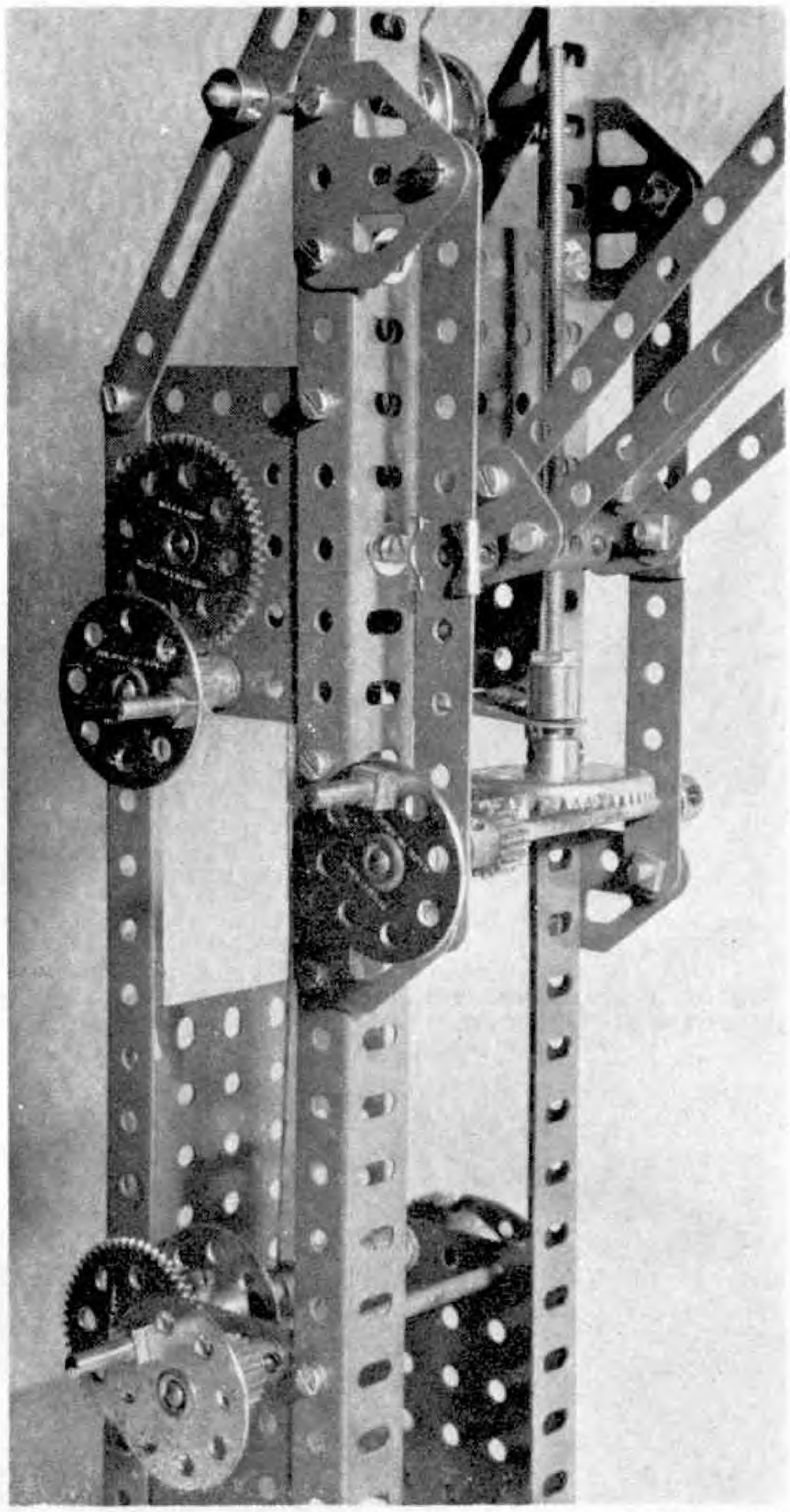


Fig. 7a. Close up of the operating mechanisms of the Toplis Crane. The top handwheel is for luffing the jib, by a simple cord and pulley system. The handwheel at front centre drives a screw mechanism for adjusting the pivot point at the lower end of the jib.

Having secured adequate strength with due regard for overall weight, stability of the crane is of importance. This means that when the crane is hoisting its heaviest safe working load at the extremity of its reach it must never be in danger of toppling over. This safety factor is achieved by making sure that the crane is adequately counterbalanced by placing ballast weights in an appropriate position. Referring back to Fig. 8, a sliding counter-weight is arranged at position (b), its sole purpose being to balance the parallelogram jib system for power economy in jib luffing. The fixed counter-weight at (a), however, is a ballast box (loaded with scrap lead in the model) to balance the working load of the crane proper.

Fig. 11 shows another method of counter-balancing commonly used on Tower cranes where the ballast box is fitted to a cantilever beam supported by long stays from the top of the crane's central mast. For

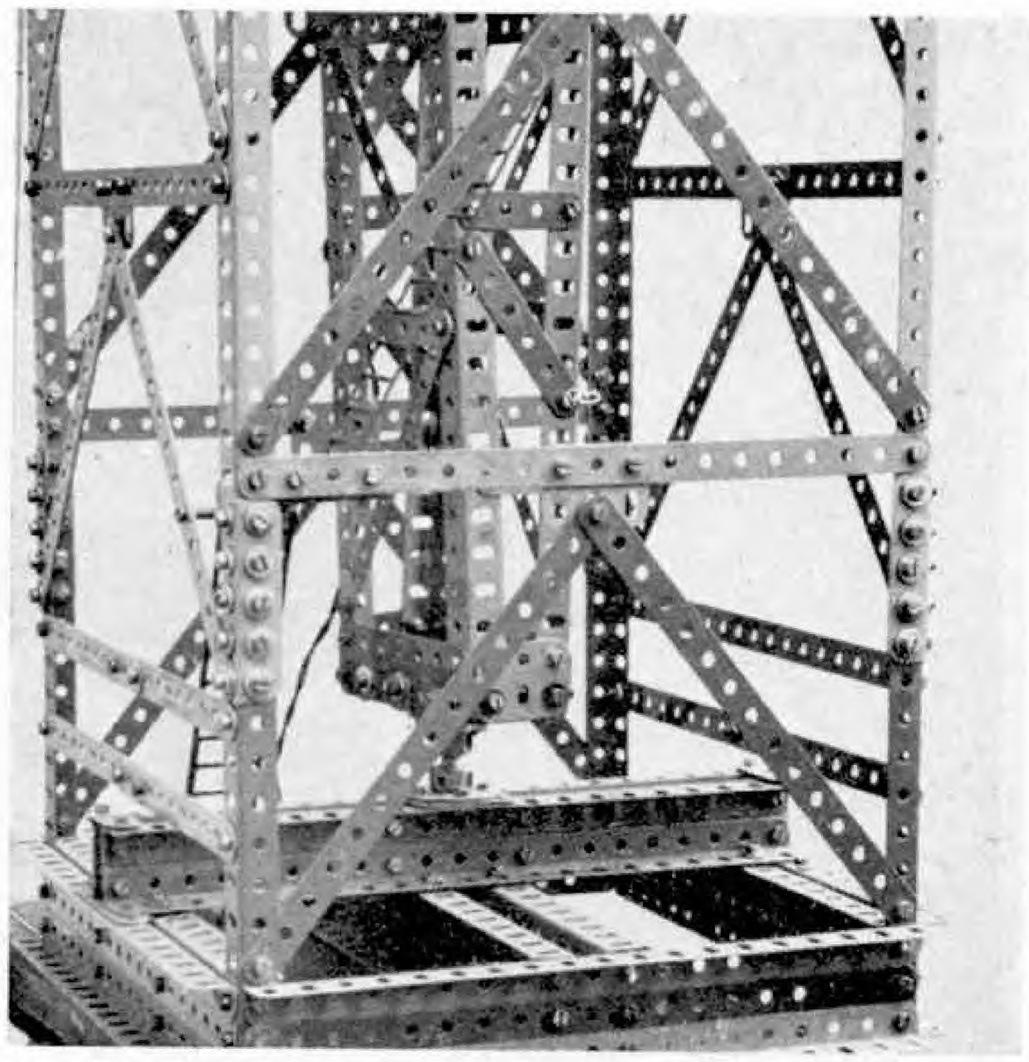
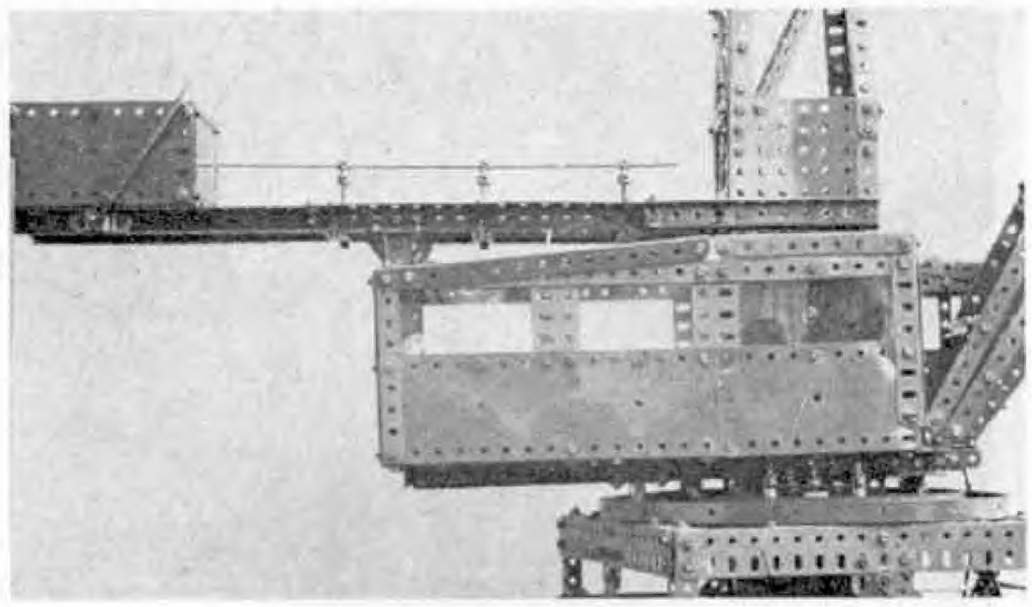


Fig. 10. Above: Base of a free-standing Monotower Crane heavily reinforced with compound girders to take the entire downward thrust of the crane's superstructure on a simple ball bearing.

Fig. 11. Below: Counter balance ballast box typical of that employed on Monotower Cranes. Note that side thrust rollers only are employed in the turntable.



model makers, in the absence of suitable scrap lead, the ballast may be provided by spare Meccano Strips, Plates, Washers and Nuts & Bolts, the use of which makes the ballast adjustment very simple. In calculating safety factors of the nature outlined, the crane engineer must also take wind speeds into consideration and stresses on the hoisting gear and crane stability which could arise through operator errors.

In the last two types of crane mentioned, the revolving superstructure has been carried on a strong centre post made of Angle Girders cross braced with strips which pivots inside the crane tower and is an ideal method of slewing such cranes as no heavy turntable is required at the upper level, a light-duty side thrust roller race being all that is required.

The types of crane which the Meccano enthusiast can model are legion and hundreds of examples of them are to be seen all over the country whether inland or at seaports. Mobile cranes form a class of their own although the principles outlined are as important for these as for any other class of crane. The gantry crane is another very popular type which is very well covered by the Meccano Manuals of Instructions and since it is virtually a travelling bridge its inherent stability is a built-in feature allowing it to cope with the greatest loads, weight for weight, by comparison with any other type of crane.

No mention of crane structures would be complete without reference to the Giant Block-Setting Cranes which have featured in Meccano literature for more than half a century. Very few of these juggernauts survive to-day as the breakwaters and harbours which they built over the past century are now well established and modern construction utilises pre-cast, or site-poured concrete by contrast with the fifty-ton blocks of solid masonry which these veteran ' Titans ' set into place with precision of a trained eye and a steady nerve. Such cranes are fascinating challenges for the Meccano modeller and Fig. 12 shows some aspects of their rugged structure which may be reproduced in Meccano.

In the following chapter we shall be considering motions of the crane, in particular the hoisting mechanisms and types of turntables. The range of Meccano parts is so vast by comparison with any competitive system that highly efficient turntables and powerful drives to them may be constructed from the existing Meccano range without resort to purpose-made parts or ' foreign ' bodies and diameters varying from 1 in. to a couple of feet are well within the scope of the system.

Part 4—Winding Gear

NO MATTER to what size a model crane is made, the greatest satisfaction to the modeller comes when it springs to life with the first movement of its winding drum. The simplest form of ready-made winder in the Meccano system is the Crank Handle which is found in all Meccano Outfits from the smallest to the largest and with the simple set-up shown in Fig. 1. it is perfectly efficient. At one time, younger modellers had some difficulty in securing the hoisting cord to the Crank Handle, as simple hitches and knots gave no real grip, but with the introduction of the Cord Anchoring Spring, Part No. 176, a positive grip was assured.

Two points are worth noting with regard to the use of this part as a cord anchor. It is important that, when the winding handle is turned, tension come on to the small loop arm of the Anchoring Spring in such a way as to tend to wrap the Spring more tightly round the shaft as the load is hoisted. Fig. 1 shows the Cord Anchoring Spring correctly set for hoisting with a clockwise motion. Before attaching the hoisting cord to the Spring, the cord should first be tied with a half-hitch round the shaft and its ' tail ' secured to the small loop on the Spring. This prevents ' snatch ' when the hoisting cord has run out to its fullest extent.

For younger model-builders, the process of fitting a

Cord Anchoring Spring to a Meccano Axle Rod or Crank Handle can present something of a difficulty, as a twisting motion on the Spring is required to make it open its coils very slightly to accommodate the shaft diameter. This is made very simple by first locking a Bush Wheel or Pulley on to the shaft and trapping the loop of the Anchoring Spring with the thumb. The shaft may then be twisted into the Spring, using the Bush Wheel to apply the twist in such a direction that the Spring tends to unwind (very slightly) as it is pushed on to the shaft. The moment that the Spring loop is released, the whole Spring will grip the shaft very tightly. The greater the pull of the winding cord on the loop, the stronger will be its grip on the shaft. Fig. 2 shows the method of adjusting the position of the Cord Anchoring Spring on an Axle Rod.

With just a few parts, a rugged and realistic winch can be constructed such as the typical two-handed donkey winch shown in Fig. 3. This may be incorporated in hand-operated derrick cranes or mounted on low-loader trailers for winching heavy loads aboard and is very simple to make. A novel feature of this winch is the use of the slotted holes in the two Triangular Plates forming the frames. As can be seen from the illustration, a 15-teeth Pinion is meshed with a 38-teeth Gear Wheel giving a gear ratio of approximately $2\frac{1}{2}$: 1 which is very useful and gives a nice scale speed of wind-in. End checks for the winding barrel are provided by an electrical Bush Wheel (Part No. 518) at one end, and at the other end two $\frac{3}{4}$ in. Washers which are free to ride against the 38-teeth Gear Wheel and thus prevent chafing of the cord by the gear teeth. The small Bush Wheel provides splendid anchorage for the cord. The two side frames are braced apart by 3 in. Threaded Rods, lock-nutted as shown. Further realism may be added to the winch by providing a Pawl and Ratchet, Parts Nos. 147 and 148, fitted to the side frames.

Despite the simplicity of the Axle Rod as a winding drum, it has advantages even in advanced models. Its narrow diameter gives a very fine control of hoisting so that critical adjustments for such things as the tripping rings for a single-suspension bucket grab can be made with precision, while auxiliary hoists in large models can be nicely scaled with small winding drums. In engineering practice, wire ropes are used extremely extensively in all kinds of cranes, excavators draglines, etc., and are often of a very generous size to take strains of hoisting, luffing, winching, etc. Such ropes run more efficiently, with less wear and internal friction, if they are not bent to a sharp radius round a narrow diameter winding drum.

The Meccano system lends itself well to the construction of larger winding drums by making use of the standard cylinders available. These are illustrated in Fig. 4 and figure quite frequently in published models. The standard shaft fitted with electrical Bush Wheels, by the way, may be augmented by mounting one or two Couplings on the shaft to give a small increase in diameter, and a variety of end cheeks for these parts is available in the shape of Bush Wheels, Flanged Wheels, Face Plates, Sprocket Wheels, large Gear Wheels and the Circular Plates. Such end cheeks have the advantage of perforations through which a heavy hoisting cord can be threaded to be secured on the outside, as shown in Fig. 5. In this illustration a Rod and Strip Connector forms a ' Thimble,' in the throat of which a spliced or whipped loop at the inner end of the hoisting rope is seized. A Washer ensures a sure grip for the actual loop. In simple models, however, the cord can be passed through two holes of the end cheek and knotted internally, as shown in Fig. 3.

Winding capacity for two of the drums illustrated in

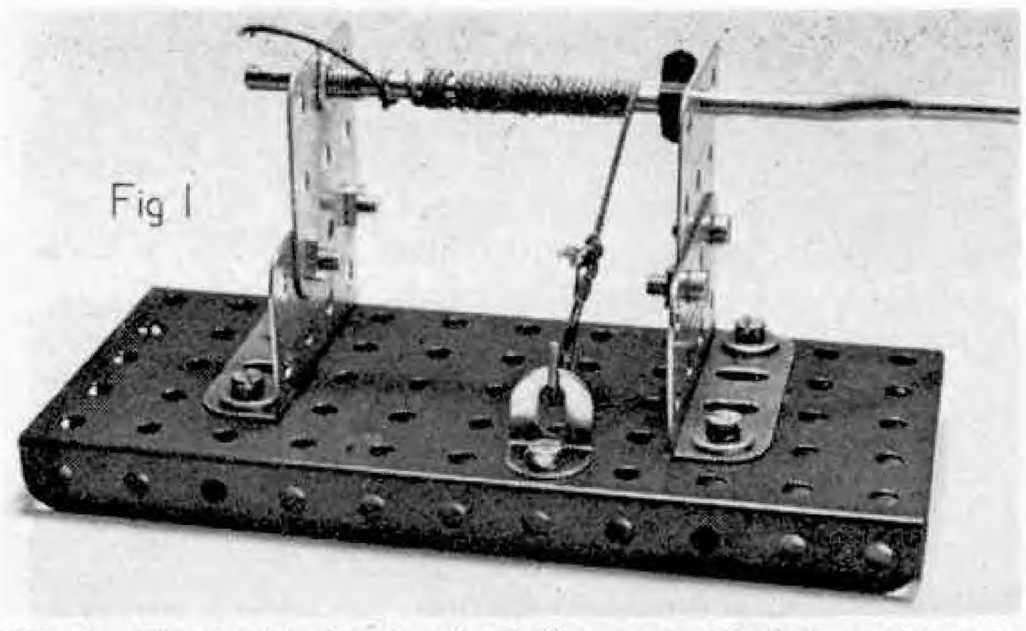


Fig. 1. The most simple of all Meccano winding equipment, the Crank Handle, seen here fitted with a Cord Anchoring Spring.

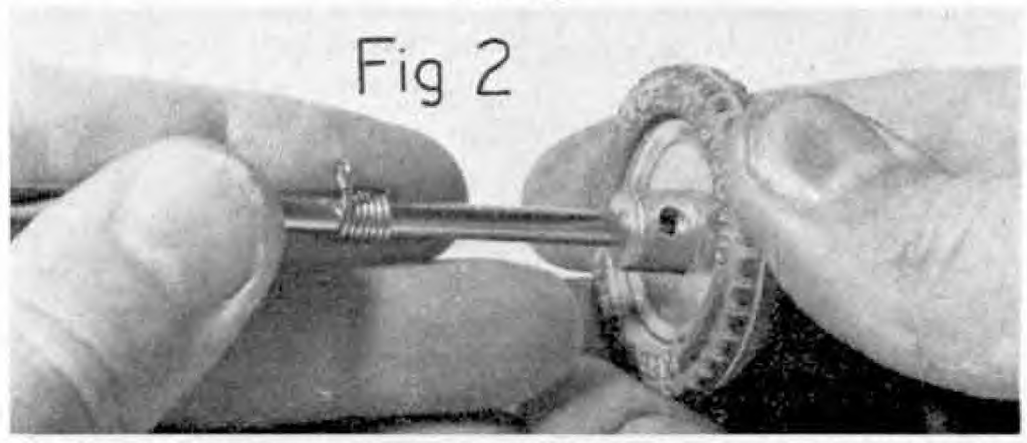


Fig. 2. A simple method of positioning the Cord Anchoring Spring on an Axle Rod with the aid of a Pulley and Tyre.

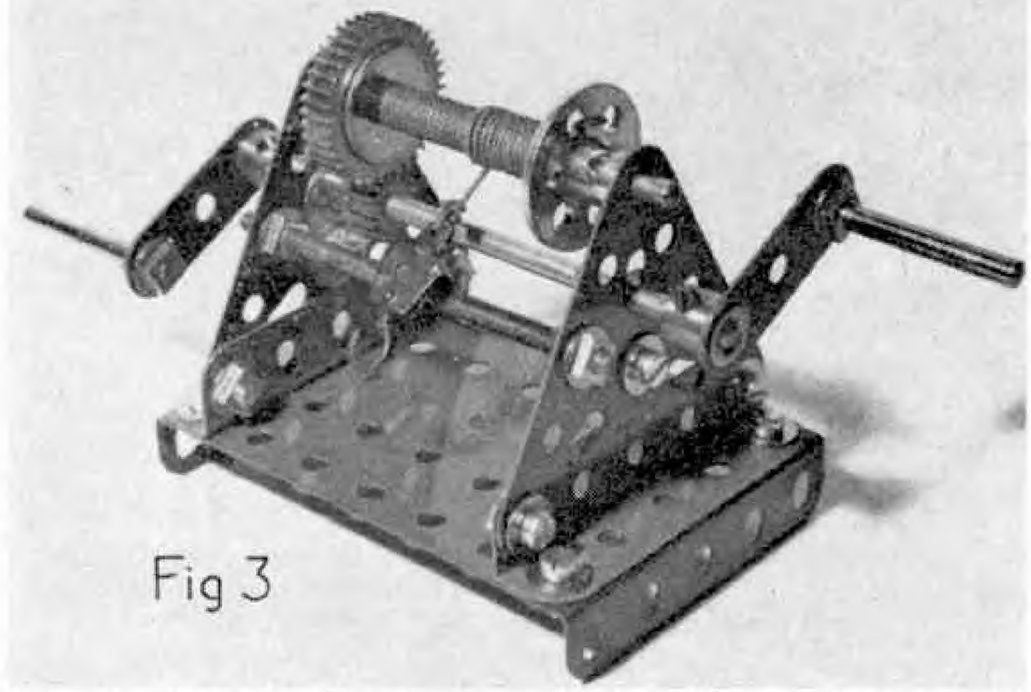


Fig. 3. Two-handed donkey winch. Note non-standard spacing of gears making use of the slotted holes in the triangular side plates.

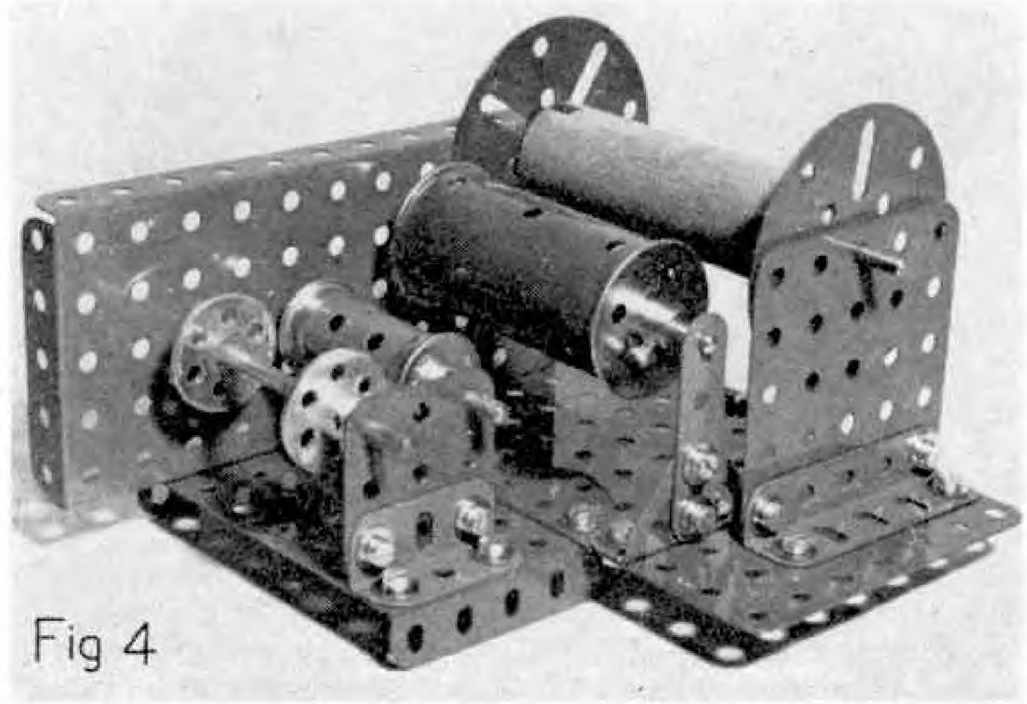


Fig. 4. A selection of Meccano winding drums made from standard cylindrical-shaped parts.

Fig. 4 can be improved by adding end cheecks as shown in Fig. 6. Normally the Sleeve Piece seen here is centralised by small Flanged Wheels fitted externally, while the 2½ in. Cylinder is centralised by large Flange wheels fitted internally. The Sleeve Piece is carried on internally-mounted Chimney Adaptors, Part No. 164, and the end cheeks are provided by Bush Wheels.

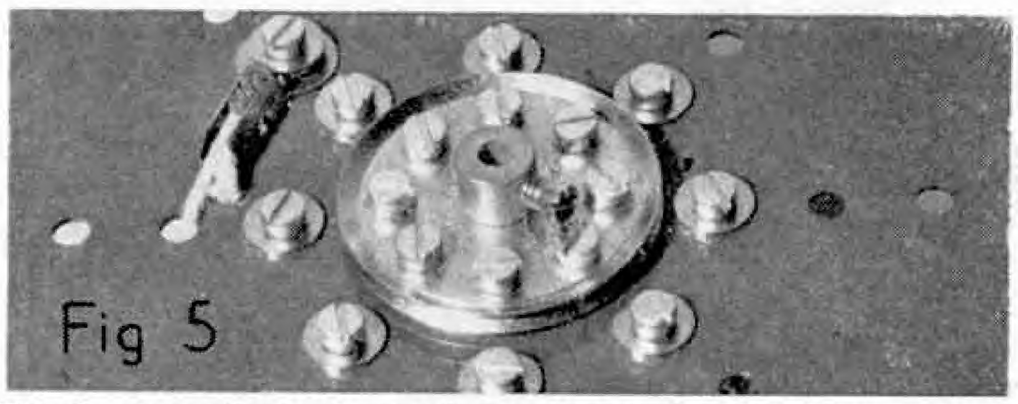


Fig. 5. A method of securing a heavy-duty winding cord to the outside of a winding drum. Note the use of a Rod and Strip Connector as a "thimble".

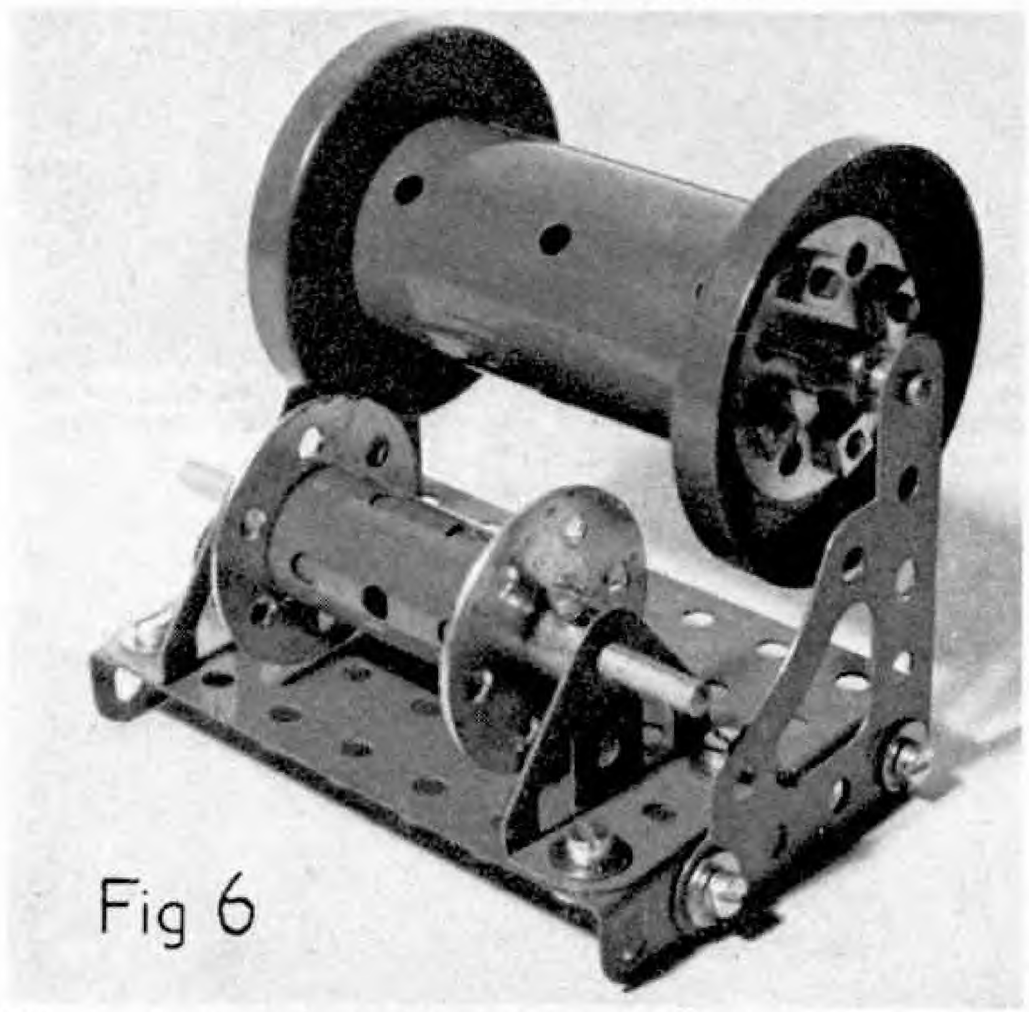


Fig. 6. Improved versions of winding drums, the smaller made from a Sleeve Piece and the larger from a 2½ in. Cylinder fitted with bigger end cheeks.

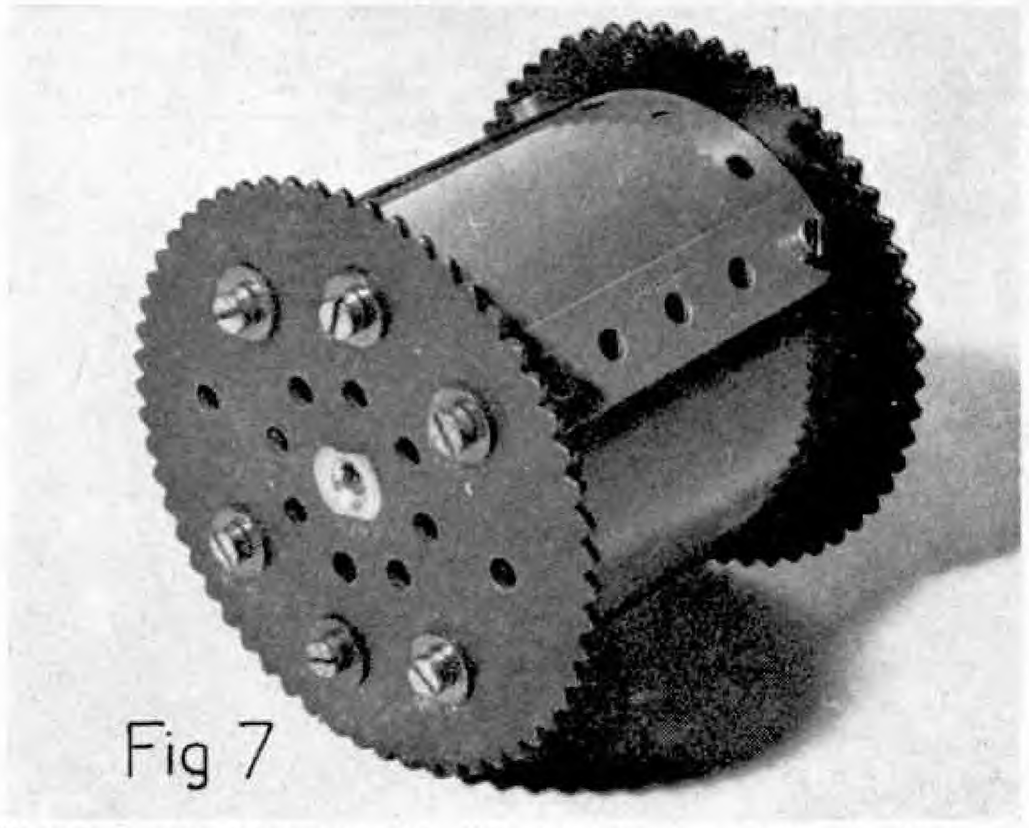


Fig. 7. Large-diameter winding barrels can easily be built-up from curved Flexible Plates. Note the use of heavy-duty end cheeks, supplied by Sprocket Wheels in this case.

Construction of end cheeks for the 2½ in. Cylinder is a little more involved. Four 3 in. Threaded Rods are each fitted with a Nut and Washer, then are pushed through four alternate holes of an 8-hole Bush Wheel to bring them into register with the four holes punched in the Wheel Flange, Part No. 137, illustrated. Each Threaded Rod is then fitted with two Anchoring Springs for Cord, which will slide over the threads of the Rods quite easily, these Springs simply acting as spacers to take up the 'slack' in the circumference of the 2½ in. Cylinder, which is next passed over the four Threaded Rods. When the second Wheel Flange and 8-hole Bush Wheel are lock-nutted into place, the Cylinder is tightly held concentrically between the end cheeks. If necessary, the hoisting cord to be wound on this reel can be secured by a Washer and Bolt through one of the perforations in the Cylinder.

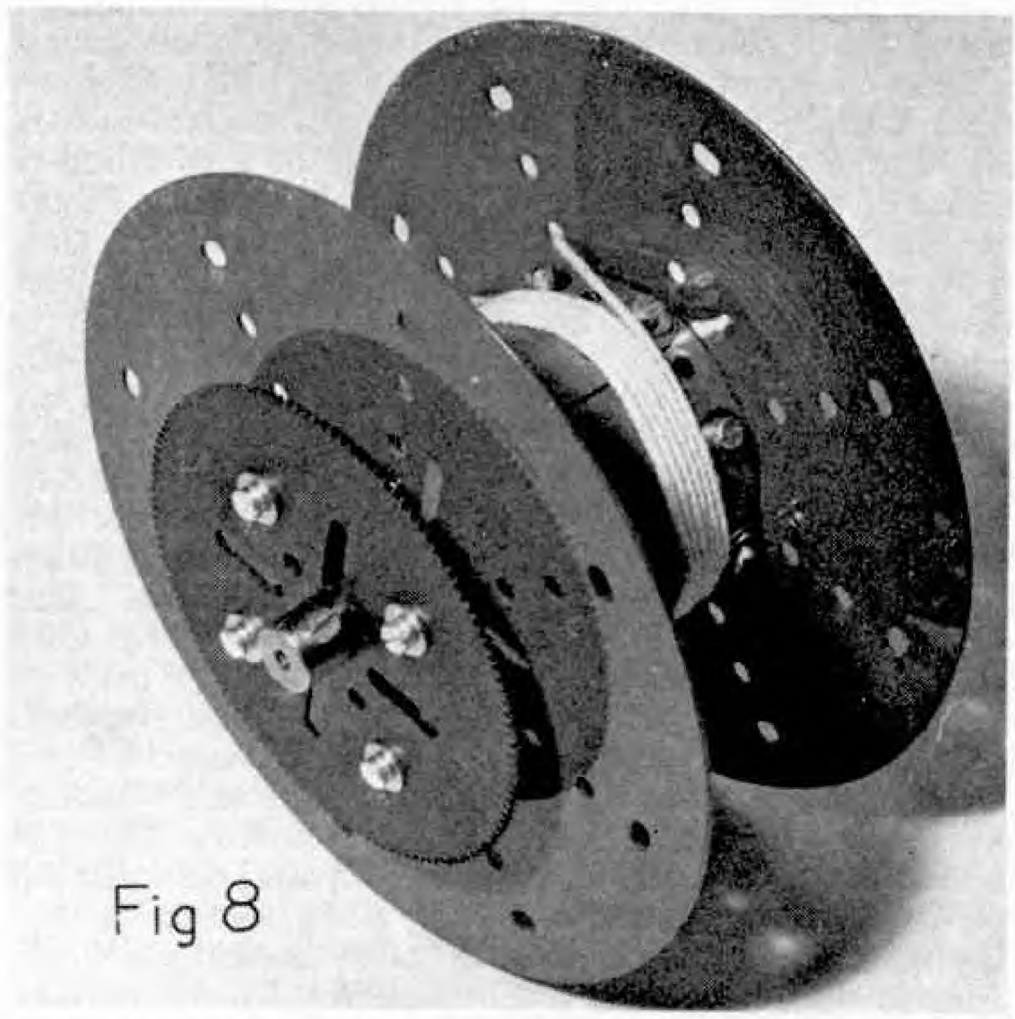


Fig. 8. A "deep-throated" winding drum for a colliery winding engine or large model dragline. The driving gear is bolted directly to the drum for rugged drive.

If longer Threaded Rods are used in the construction of the latter drum they may, with advantage, be passed through the holes of one of the larger Sprocket Wheels or Gear Wheels to provide a very positive drive.

Some drum drive arrangements require a slow-moving, large-diameter barrel, and this is readily achieved in standard Meccano parts by using 2½ in. × 2½ in. Flexible Plates, Part No. 200, which are already curved to the form required. Fig. 7 shows a drum built up from these plates and mounted between two 3 in. Sprocket Wheels internally fitted with four, six or eight Threaded bosses, Part No. 64. The transverse tapped bores of the Threaded Bosses are used for securing the four Curved Plates required at four points spaced at 90° round the drum. The remaining two or four Bosses in each end cheek act as bearers to accommodate the curvature of the Plates. The slotted holes in the Curved Plates lend themselves very well to cylindrical adjustment of the drum, but, for strength and appearance, these are overlaid with 2½ in. Perforated Strips.

The "Plate technique" can be applied in making specially-large drums for colliery winding engines or large models of heavy draglines, as shown in Fig. 8. Again, a driving gear is attached directly to the 6 in.

diameter Circular Plate acting as the end cheek so that a very rugged drive can be applied to the drum. If the far cheek is fitted externally with a Circular Girder, Part No. 143, a large-diameter brake ring is available for a heavy-duty contracting brake. Such a drum would accommodate several hundred yards of heavy-duty cord such as that used for off-shore sea fishing lines. A medium-size drum can be made on similar lines using the 4 in. diameter Circular Plate. Although Fig. 8 shows securing Bolts fitted to each anchoring point supplied by the Threaded Bosses beneath the Plates, alternate Bolts may be removed after the joins in the Curved Plates have been secured.

Just to give some idea of the versatility of Meccano parts in coping with any model from the humble to the mighty, Fig. 9 shows a winding drum of no less than 9½ in. diameter ! Although a rather unusual requirement for a model, the method of rotating the drum will be of particular interest to advanced model-builders since it employs one of the oldest systems of gear drives, i.e. peg teeth. The 167b Flanged Ring is fitted with eight sections of 4 in. Curved Strips, each fitted with ⅜ in. Bolts and Nuts. The drive comes from a 6-hole Bush Wheel fitted with short Threaded Pins which impart a surprisingly smooth motion to the large drum.

Brake systems for model cranes are featured frequently in Meccano Manuals and literature and many of them have been quite ingenious. Fig. 10 shows two simple, but very effective brakes which are the essence of simplicity. The left-hand section shows a slip brake comprising a weighted lever arm fitted to a Double Arm Crank mounted on a Pivot Bolt, about which it is free to move. One arm of the Crank engages in the " V " slot of the 1 in. Pulley which would be fitted to the winding drum or gearing. A 2½ in. Driving Band applies tension to the brake lever which may be adjusted by shortening the rubber band with short loops over the two Bolts between which it is stretched. Such a brake is normally in the " on " position so that it is necessary to raise the lever to allow the 1 in. Pulley to ' slip.'

The right-hand arrangement in Fig. 10 shows a very simple but versatile brake capable of immediate adjustment both for tensioning and for application. The brake lever is a 4 in. Axle Rod fitted with a Handrail Coupling for a handle and it is pivoted on a Short Coupling half-way up the side plate of the crane gearbox. The lower end of the brake lever carries a Slide Piece, Part No. 50 which rubs against a Tension Spring, Part No. 43 and is thus held in any desired position. A Threaded Pin attached to the side plate acts as a simple stop for rearward movement of the brake lever. The brake ' shoe ' is another Slide Piece which embraces the tread of a 1 in. Motor Tyre, Part No. 142c when the brake lever is set to the " on " position. As shown, the position of the Slide Piece ensures absolute locking of the Motor Tyre in the clockwise direction and will hold a winding barrel, to which the brake is fitted, against any normal load. Adjustment of the Slide Piece up the brake lever will give finer degrees of braking. Additional tension may be applied to the movement of the brake lever simply by stretching the Tension Spring to a wider anchorage or by lowering the bottom Slide Piece. Other sizes of Motor Tyre and Pulley can be worked satisfactorily with this design which, despite its simplicity, is very efficient.

Fig. 11 shows a specimen crane gearbox in which simple brakes are fitted in the form of loops of cord passed round Pulleys and held in tension by counter-weighted brake levers. This method is quite effective as a simple brake and may be applied satisfactorily in

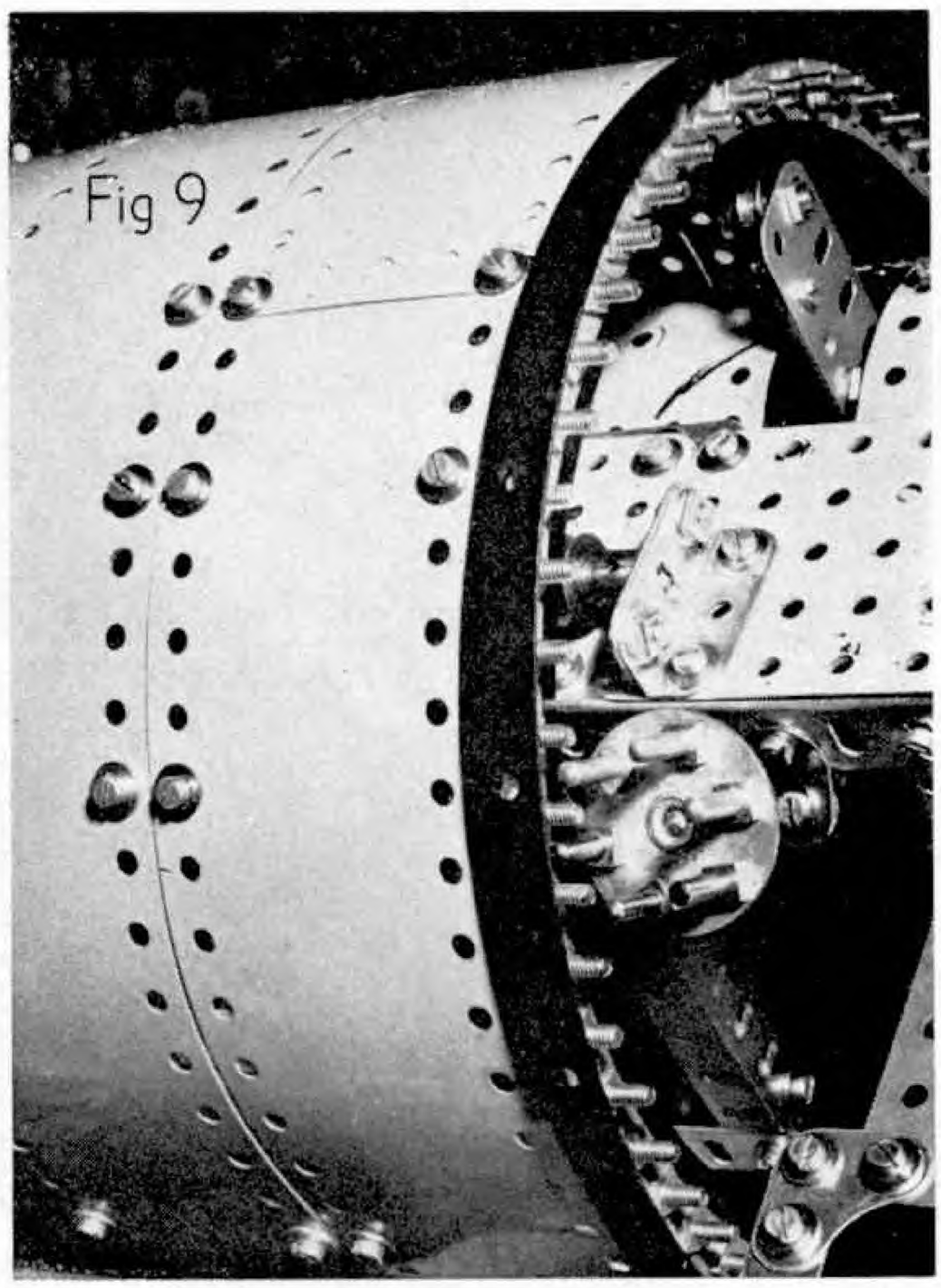


Fig. 9. This giant winding drum is driven by one of the oldest gear principles known—peg gears. In this case the pegs are supplied by Bolts and Threaded Pins.

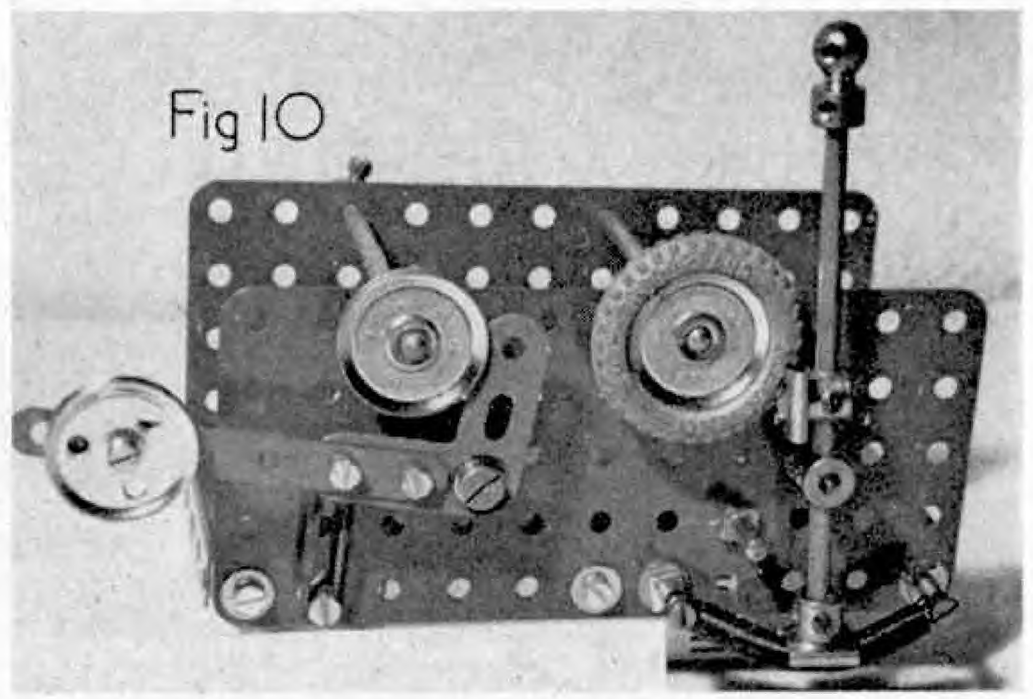
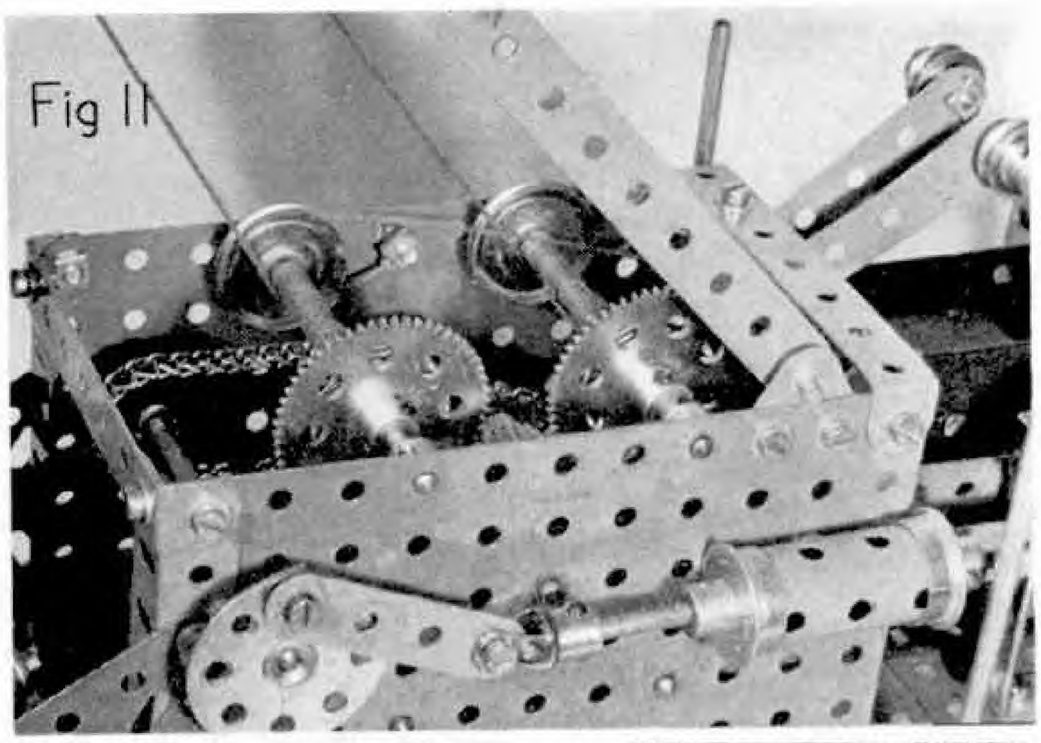
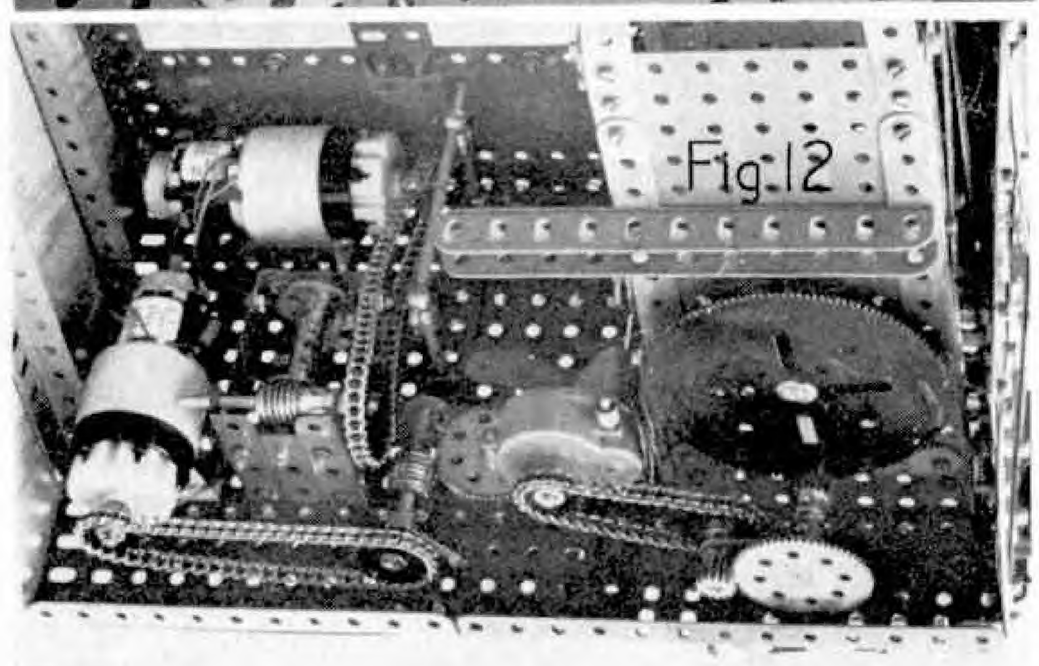


Fig. 10. Two simple but effective brake systems for winding drums. On the left is a " slip " brake. On the right a versatile positive-lock brake capable of fine adjustment.

smaller models. However, it has the disadvantage that cord tends to stretch rather easily and a vigorous release of the brake lever can throw the cord loops off the pulleys.

In contrast to Fig. 11, which shows a gearbox feeding four different movements from one shaft, Fig. 12 shows the neat control cabin lay-out of a model Monotower Crane. The use of individual power units is quite striking and is well in accordance with modern crane-building practice, although at one time it was customary to install a very heavy power plant in large cranes which





drove all of the movements by means of lengthy shafts, masses of gearing and flexible couplings. Power losses were considerable under these circumstances, but, in the days of cheap coal and lack of smaller high-power units, this was no great problem. Many veteran Meccano modellers enjoy reproducing the earlier models of such cranes, but the modern Meccano D.C. Motor with 6-ratio gearbox gives the enthusiast tremendous scope for placing his drive exactly where he wants it. This means that each unit is supplying the correct power for its individual job, with minimum power-loss, through extended shafting, and, of course, with worm drives to the movements, as shown in the illustration, braking problems do not arise to the same extent as would be in the case of winding drums and other movements being dependent upon clutch linkages. Individual electric power units have the advantage of small size, internal gearboxes and remote-control, thus reducing operator fatigue and making the crane available from ground control. The Meccano Constructors' Guide is not intended to give comprehensive coverage to the topics outlined in this Chapter, but the enthusiast will find a rich source of material on crane gearboxes and movements both in pre-war and post-war Meccano Magazines, due to the tremendous popularity of cranes as models throughout the history of Meccano.

Chapter V will be dealing with swivels and turntables for cranes and other similar machines and will include a complete built-up roller bearing making use of the new Meccano Large-toothed Quadrants and special Pinion.

Fig. 11. Cord brakes fitted to an early Meccano Breakdown Crane. Fig. 12. Individual electric power units in a model of a modern Monotower Crane. Note the small winding drums made from Couplings, and the Worm drives to the movements.

"STARDUST FORTUNES"

An amusing personal experience described by RICHARD LEE



IN THIS COUNTRY, seeing what the stars hold for us in the horoscope columns provides a form of amusement or light escapism. In the East, however, the telling of fortunes by Astrology is not only big business—it is a very serious business also. In India, where even today most marriages are arranged by the parents of the prospective brides and grooms—who often see each other for the very first time at the actual wedding ceremony—the most important part of the arrangements concerns obtaining horoscopes of the intended couple in order to see whether these horoscopes forecast similar futures for the pair. Sometimes the horoscopes will differ, perhaps forecasting that the groom is destined to go overseas, and the bride may be forecast never to leave her native shores. In circumstances such as these the marriage is invariably 'off' —for what would be the use of such a union if it has to be spent apart?

Eleven years ago, when I was in India as a single man, I scoffed at the idea that Astrology could accurately foretell the future. I was warned by an Indian colleague not to be damning in my attitude without first giving it a trial. I agreed to this and he undertook to get me a 'pukka' horoscope. I had to pay 25 Rupees (about £2.0.0) for it and also to wait about three months for its arrival. When it came in the post from the Indian Astrological Research Institute, from Kodakara in Travancore State, I was impressed at once by the trouble that they had taken over it. It was in the form of a bound book with 46 typewritten

pages which described in detail the sort of life I was about to lead. But I still had no doubt at all that the forecasts which it made were quite 'up the creek'—for instance it said that I would return to England by a certain date which was quite impossible if I was to work out my contract signed with my employers! I had no intention of breaking this contract of service and accordingly I took no notice of the forecasts. However, a short while after both my parents died suddenly and I was forced to fly home. Events caused me to stay in England ever since and it was later that I realised that in fact the horoscope had been quite correct.

After this I was not surprised to find myself getting married during the period allocated to me for this event by the good book. I began to view with apprehension the forecast that I would have four children, two boys and two girls! Five years of married life on, however, saw me at the situation of being the father of two boys and a girl and my wife expecting No. 4 at the maternity home. Horoscope apart we both felt sure that the next would be a girl anyway—parents will know the 'feeling' one gets before the latest arrival actually is born. I was now quite convinced that the book had it all worked out. When the nurse told me I had a third son I was both amazed and relieved, "Thank goodness the Horoscope is wrong at last," I told my wife, for its uncanny accuracy to this time had been rapidly turning it in a *'HORROR-scope'*—predicting when I should fall ill and how long I was destined to live and so on.

Although the horoscope did make this slight error it did well to forecast our family at four as for medical reasons we are unable to have any more anyway. The Astrologers would explain this sort of slight discrepancy by explaining that it is not always possible to be absolutely accurate as it is rarely one knows one's own exact moment of birth—one of the vital statistics that they require to ascertain the position of the planets. Also they need to know the exact Latitude and Longitude of the place of birth. I have had the process explained to me and all that I understood about it is that it appears to be very complicated indeed!

My horoscope is written in English, with abundant spelling mistakes, and the first sentence of it says *"When we examine a horoscope the first that we should see is the longevity of life. There is absolutely no use predicting the future of a man who you find to possess a short life."* It then goes on to tell me that I can expect to reach the age of 84—in which case I shall be well content! One amusing spelling mistake concerns my wife who 'will be an unfaded *flour* in the garden of my life,' and there are many other references which are not at all clear such as the forecast that I shall have business in *'fire-places'* and even in America. I still have not the remotest connection with either, but of course there is still time!

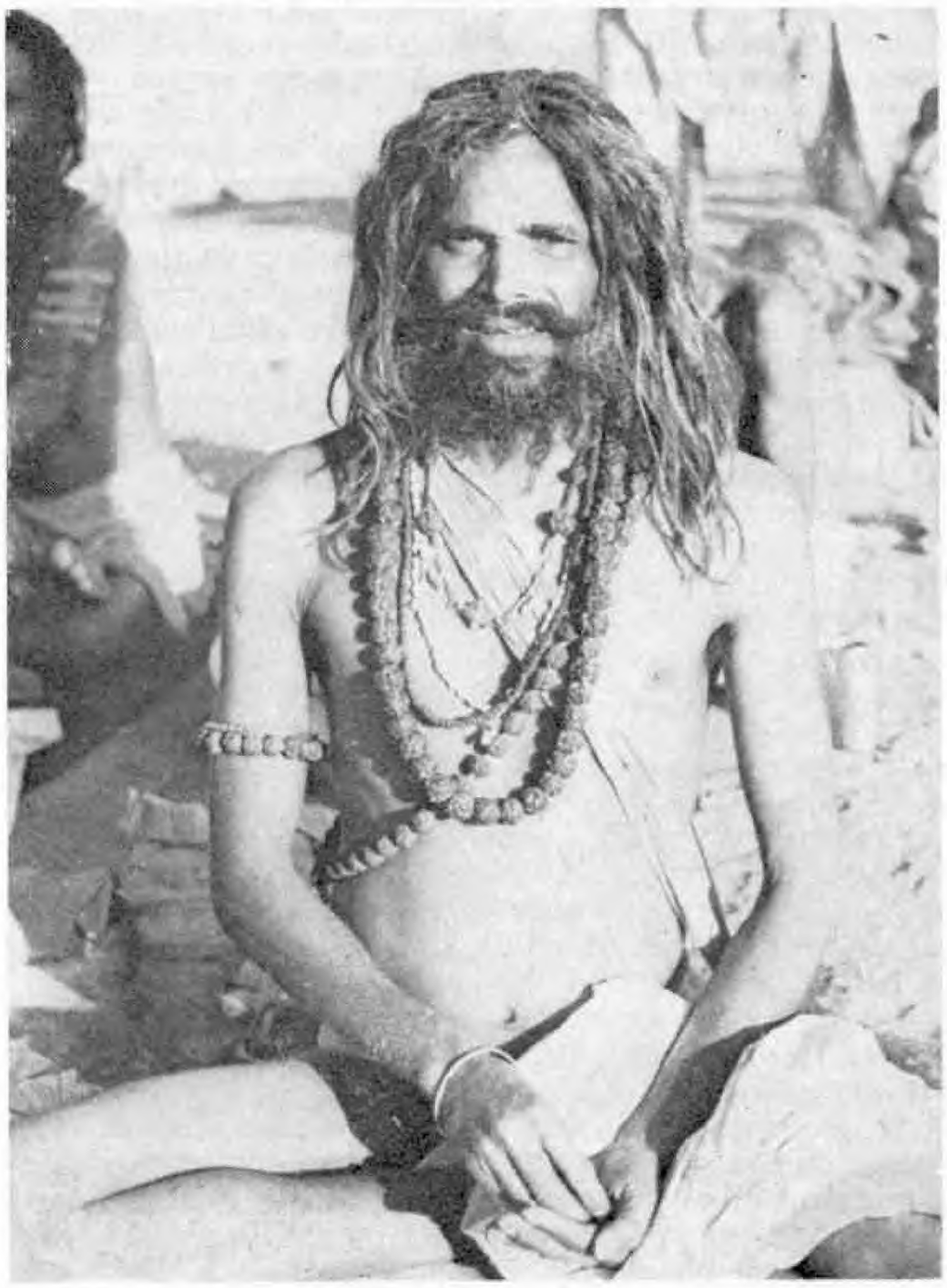
In this country the telling of fortunes by palmistry or astrology is an offence under the Vagrancy Act, but not in India where there are literally thousands of itinerant vagrant fortune-tellers who are willing to amuse you for an hour or two at any time by reading your palm. That much of this industry is of a fanciful nature is recognised in India by a well-known fable from the cocoa-nut-palm country of Malabar which tells of how a ragged fortune-teller pleaded with a shopkeeper for a little business, saying that he was starving and needed to earn an 'anna' or two to buy a meal. The shopkeeper cordially invited him in and then as the old man got seated to tell the shopkeeper's fortunes, the shopkeeper picked up a length of coarse



"A child marriage." The bride is just twelve years old and the groom an elderly eighteen!

rope and whipped the old man soundly with it. As the old man fell out into the street he cried, "How could you do such a cruel thing to a poor and harmless fortune-teller?" At this the shopkeeper expressed immense concern: "My dear good fellow, I am so sorry." He rushed to assist the old man to his feet. "It never occurred to me that you, being a fortune-teller, would not have known of the treatment you were about to receive from me when you entered my shop. I would never have beaten you had I thought for a moment that you would not have known!"

A typical travelling fortune teller as encountered by the author.

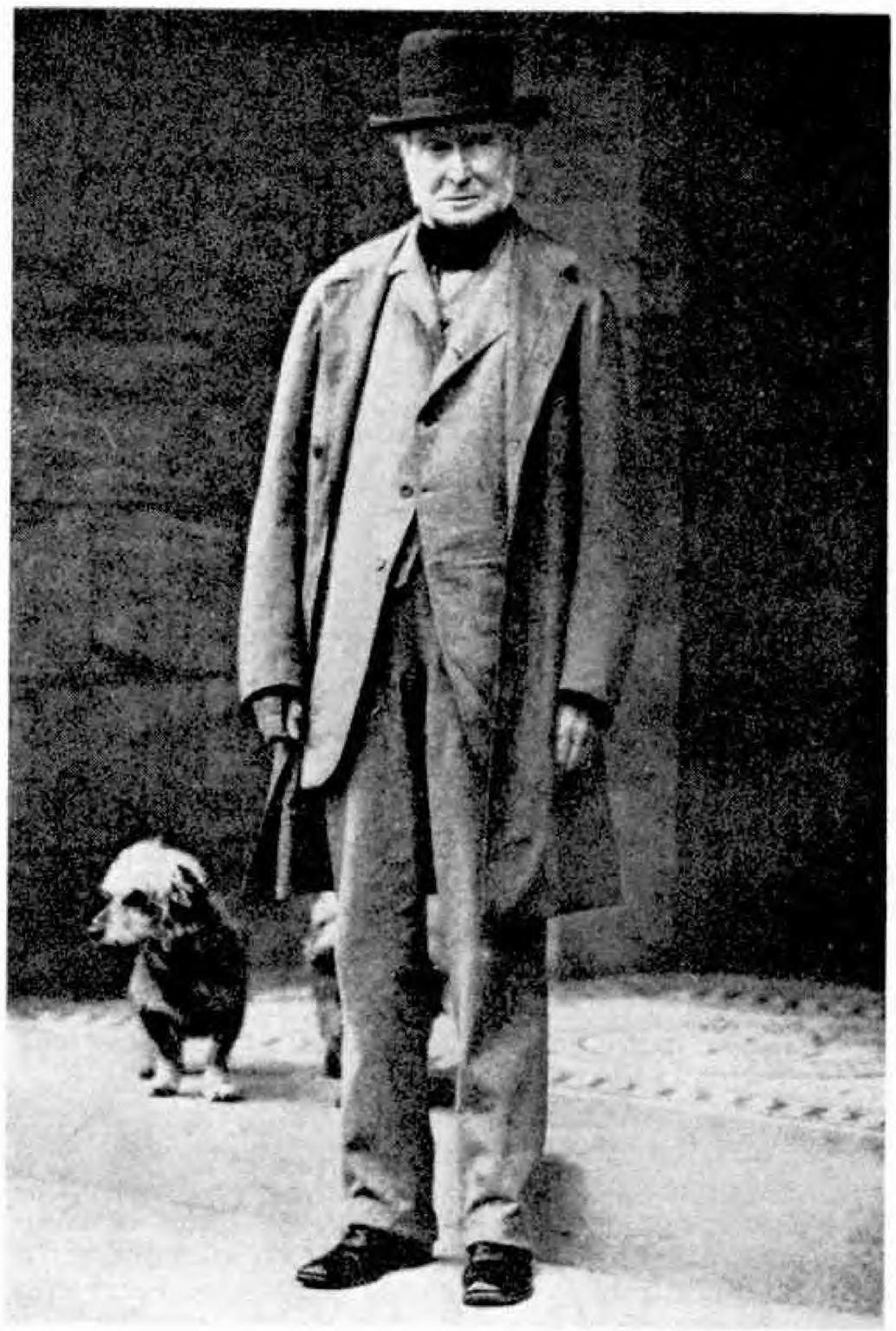


GREAT ENGINEERS No. 27

LORD ARMSTRONG

(1810—1900)

by A. W. NEAL



WILLIAM GEORGE (later Lord) Armstrong was the son of a prosperous corn merchant of Newcastle who became an alderman and a mayor of that city. William received his early education at private schools in Newcastle and later at Whickham, Northumberland. In 1826 he became a pupil at Bishop Auckland Grammar School, staying a few years.

At an early age he developed a liking for model making as well as a keen interest in mathematical subjects, but his ambitious father decided he should study law and articled him to Armorer Donkin, a local solicitor. He finished his legal curriculum in the offices of his brother-in-law, a special pleader of Lincoln's Inn, and then became a partner of Donkin's. But his interest in scientific subjects could not be repressed. He investigated water as a motive power and published an article on the subject. With an engineer called Watson he produced an improved form of hydraulic wheel, the mechanism of which became known as the 'Armstrong Pressure Wheel.'

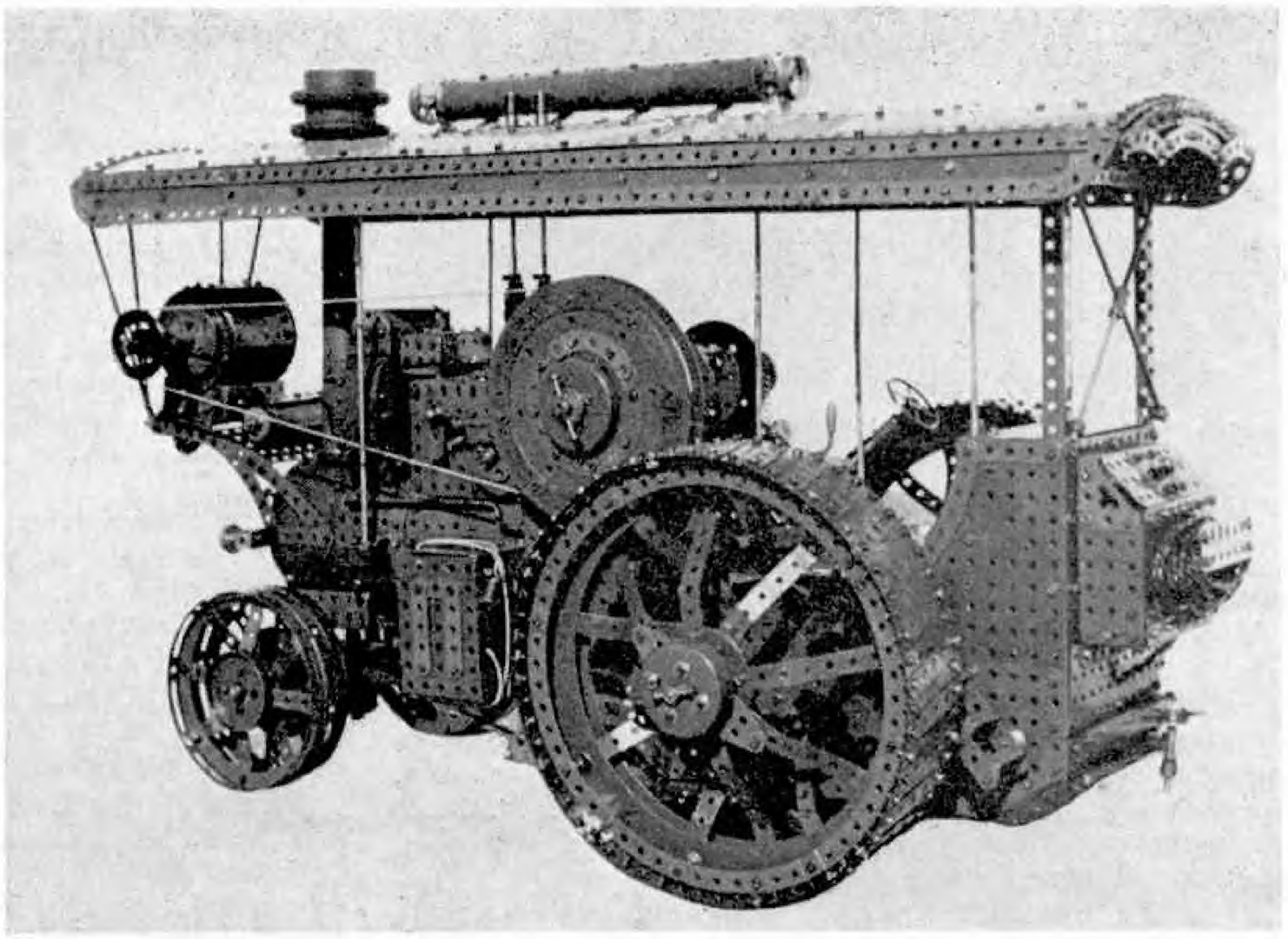
In the latter part of 1840 William Patterson was working a steam engine at Cramlington Colliery, when one of his hands touched a valve and the other was in contact with an escape of steam. He received a sharp electric shock. This interesting phenomenon so enthralled Armstrong that he studied the causes and published his findings in a paper entitled 'Electricity of Effluent Steam." Out of this he developed his hydro-electric machine. For a time he was secretary of the Whittlesea Water Company, and during this time he would have added considerably to his knowledge of hydraulics. Indeed, he eventually designed a self-operating water valve in 1847. About this time he devised a hydraulic crane, one of which was put to use on a quay at Newcastle. Donkin, Potter, Cruddas and Lambert, local people, found the money to set Armstrong as a manufacturer of these appliances. He abandoned the law and became the head of the new enterprise, the works of which were established at Elswick, near Newcastle.

Among the early orders executed at Elswick were some cranes for the Liverpool docks, an engine for the Newcastle Chronicle, mining machinery for lead mines and winding engines for the Shettleton Coal Company. In 1854 Armstrong was charged by the War Office to design mines to destroy sunken Russian ships in Sevastopol harbour. These activities during the Crimean War led him to the subject of guns and, in 1856, he produced his first example. It was designed for breech loading as distinct from muzzle-loading. Its barrel was of sheet steel with a number of wrought iron tubes shrunk onto it. It was rifled (spirally fluted) and fired an elongated shell with exceptional accuracy over a considerable distance. During the next seven years more than 3,000 Armstrong guns were supplied to the Government. But teething and other troubles arose and, for a time, muzzle-loading became popular again.

In 1868 he began building ships in the Walker yard of Mitchell and Swan, and four years later this concern became Sir William Armstrong, Mitchell and Company Limited. In 1883 he established a new shipyard at Elswick. Meantime he had been selling his guns to foreign governments, and it is interesting to note that the British Government again began to purchase breech-loaders from him. One of Armstrong's important researches dealt with the tempering of steel which paved the way to the oil-hardening process.

In 1846 he was elected a Fellow of the Royal Society, and for his work on gunnery he was made a Commander of the Bath and knighted. In 1882 he was elected president of the Institution of Civil Engineers, and in 1887 he became a baron.

AMONG THE MODEL BUILDERS



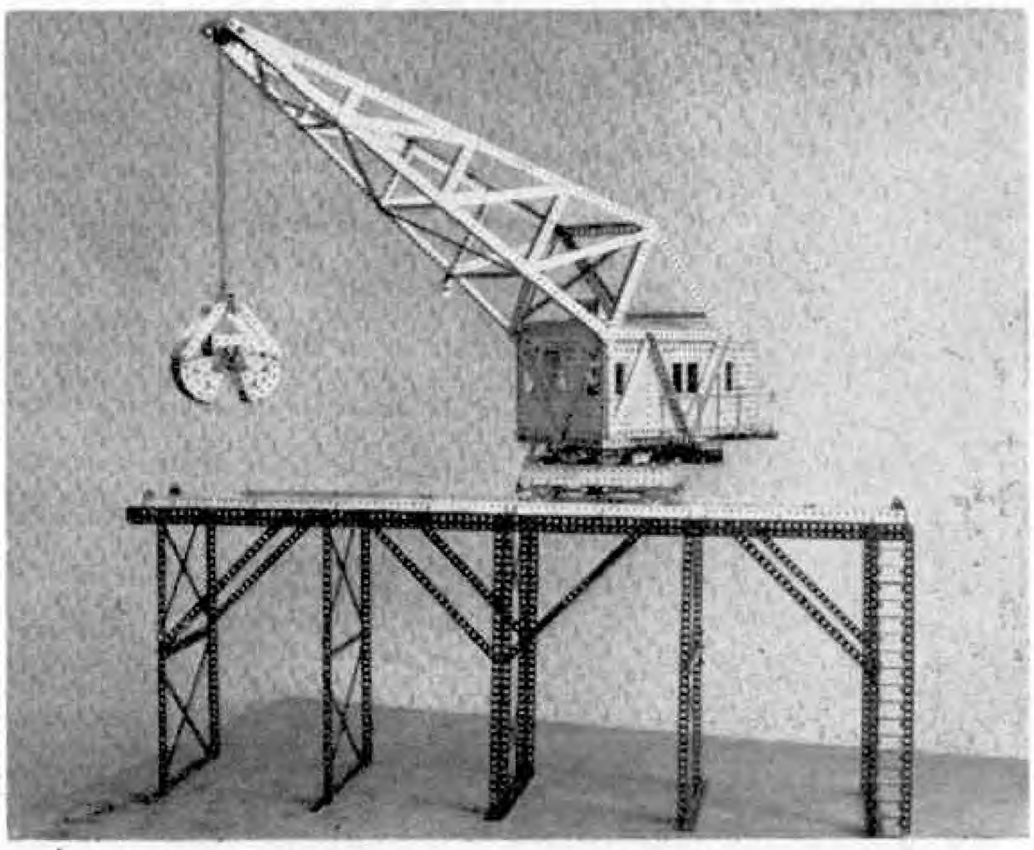
Readers' Meccano ideas described by SPANNER . . . . . .

BY WAY OF A CHANGE, this month, I propose to devote this article not to detailed descriptions of various modelling ideas and mechanisms, but rather to a general look at some of the many photographs I have had from readers: photographs showing not only interesting models, but also, in one or two cases, the modellers themselves. I have included them for two reasons; firstly, for interest, because I know most modellers like to see what fellow hobbyists have been building and, secondly, for proof—proof that Meccano is a truly international hobby. These photos have not been specially selected for their internationality, but simply taken from my files at random, yet there are more from abroad than from Britain !

Not having access to Meccano export figures, I do not know which countries outside the U.K. buy the most Meccano, but if Meccano Magazine correspondence is anything to go by, I would say that Australia and New Zealand are high on the list. New Zealand, in fact, is the home of one of the oldest existing Meccano Clubs in the world, the Christchurch Meccano Club with headquarters in Christchurch. Readers may remember that in the May issue last year we published a photo of the Club's stand at the New Zealand Industries Fair which aroused a lot of interest. One of the most talked-about exhibits on this stand was a huge model of a New Zealand Railways "Ec" Electric Locomotive built by the Club Secretary, Mr. S. J. Kennedy, and I am pleased to say that Mr. Kennedy has supplied me with one or two close-up shots of the loco, plus the following background information:

"The Lyttelton Tunnel," says Mr. K., "connecting Lyttelton Harbour and Christchurch City was opened in 1867 as part of a 5 ft. 3 in. gauge railway system which was later re-gauged to 3 ft. 6 in. As traffic increased the Lyttelton Line became a busy suburban passenger/goods line, while the smoke nuisance in the 1½ mile long tunnel became intolerable. The line was electrified in 1929.

"Six electric locomotives were supplied by the English Electric Company Limited, and these were classified "Ec" by the N.Z.R. At present most of the locomotives remain in regular service, but apparently their days are numbered. The odd shape of the "Ec"



Our leading photograph this month shows a marvellous Traction Engine built by Mr. H. Smith, of Port Elizabeth, South Africa. Above: A very neat and fully-operational Loading Grab built by Mr. Hans Hoch. It is based on a full-size Grab sited near Mr. Hoch's workshop.



The many Meccano builders of Australia are represented here by Mr. B. R. Kuss of Nambour, Queensland, who designed and built this large, well-proportioned Tipper Truck fitted with many working features.

presented a challenge to Meccano modelling, and I decided to build a model of this locomotive for a display by the Christchurch Meccano Club at the annual N.Z. Industries Fair. The New Zealand Railways were very generous in lending me copies of the general arrangement plans.

" As the prototype was 39 ft. long, and has a 45 inch diameter wheel, I decided to build a model one-eighth full size using 5½ in. diameter wheels. I was fortunate in having a large Meccano (approximately three Set 10's) to build the model.

" Building the model was not difficult, and many hours were spent on intricate details. Sand boxes, axle-boxes, leaf spring suspension and brake gear are all included on the bogie unit. Special features on the bogie units are the automatic couplers, and cow catchers (not normally seen on British locomotives) which were made by clamping sixteen 3 in. or 2½ in. axle rods between two curved 7½ in. strips, and held by fifteen ½ in. bolts.

" The simple box body is rigidly braced, and is detailed with working headlights, opening doors, pipes, handrails, ventilators, and cab interiors. The pantographs were made from Axle Rods joined by Couplings and Swivel Bearings. To keep proportion, it was necessary to brace the pantographs with bicycle spokes cut to size. These were the only non-Meccano parts used.

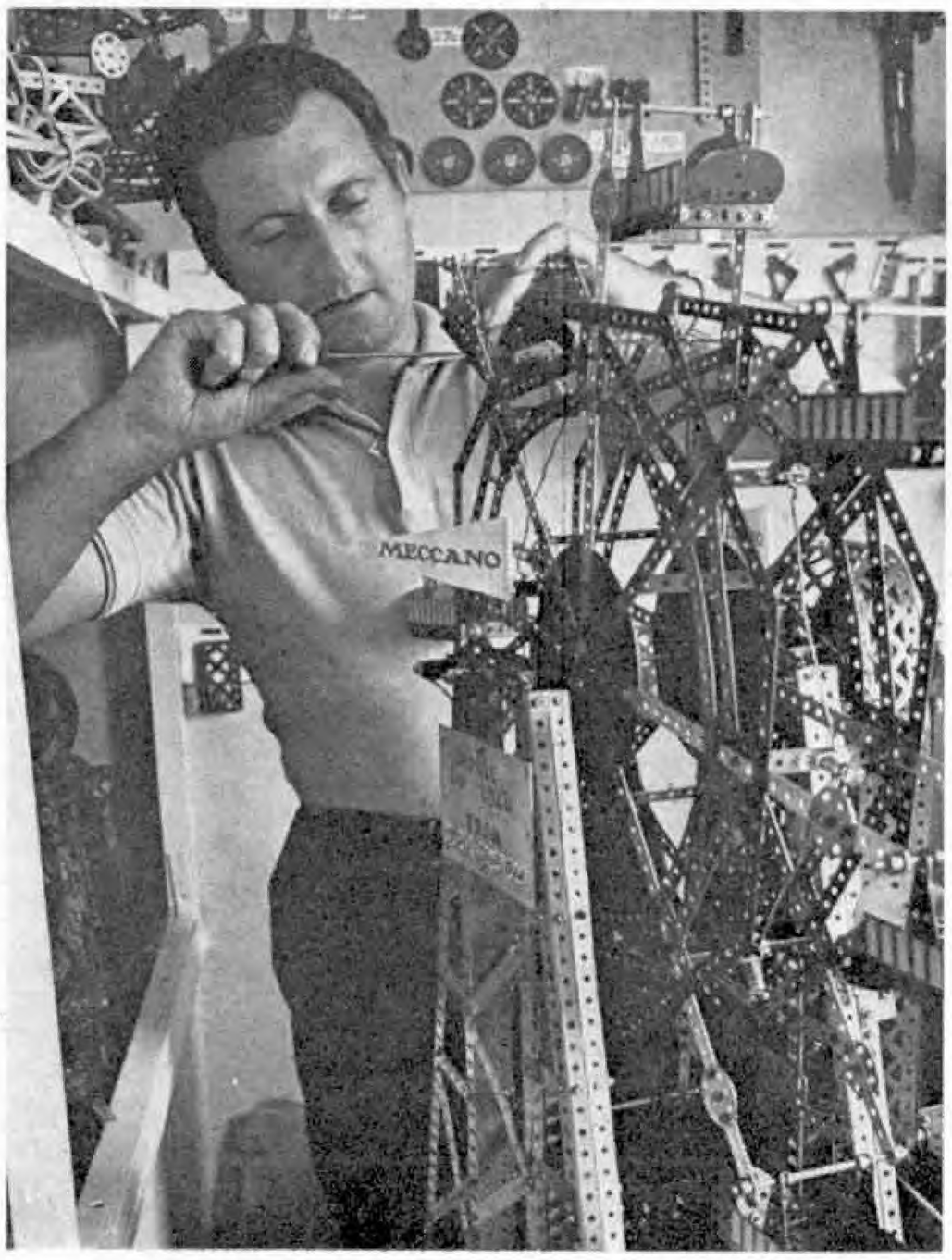
" The power drive is taken from a special heavy-duty motor through a simple manual-controlled reverse gearbox, with the final sprocket drive to two axles. The final speed was one scale mile per hour. The model was originally powered by two E.15R Motors, but for display purposes, it was more practical to use the heavy-duty motor as it required less maintenance, and could operate for very long periods without overheating.

" Overall the model took 200 hours to build and used 4,500 Nuts, Bolts and Washers, with 2,200 standard Meccano parts. The total weight was 62-lbs., and the model was insured for $NZ.450. The model's measurements were:

Length	58 in.	
Width	12½ in.	
Height	18 in.	(lowered pantograph)
Height	26 in.	(raised pantograph)

" After a successful exhibition at the Industries Fair the model was loaned to department stores for special displays, and to New Zealand Railways for a special display."

Here we see Dennis Higginson, Leader of the Stevenage Meccano Club, at work on a large fairground model. Mr. Higginson does a lot to promote interest in Meccano.



Swiss Engineer

In New Zealand, New Zealand Railways have, by supplying plans, helped Mr. Kennedy with his Meccano modelling. Thousands of miles away, in Switzerland, however, Meccano modelling has in a sense helped the Swiss national railway system, Swiss Railways, by encouraging Mr. Hans Hoch of Zurich to take up engineering.

Like so many of today's professional engineers, Mr. Hoch first learned of his aptitude for engineering as a young boy with his Meccano. He tells me, in fact, that he first became acquainted with Meccano in 1924 when one of his aunts gave him a No. O Meccano Set as a Christmas present. He was seven years old. With gifts of Accessory Outfits at subsequent Christmases he managed to build up to a No. 5 Set, but, from then on, further expansion looked difficult as the larger Sets were too expensive for his relatives at that time. Undaunted, he got a part-time job in a restaurant after school and, whenever he had a little money to spare, he spent it on Meccano Parts until he had sufficient to build the models shown in the old Super Model Leaflets as well as the No. 7 Outfit models. (It must be remembered, here, that the No. 7 Set in those early days was a very much bigger Set than the current example, being the largest available and more like the present No. 10 Set in size).

Mr. Hoch admits to having frequently dreamt as a boy that, when he grew up, he would become an engineer at the Meccano factory, " building big models," as he said. This, of course, was not feasible, but his keen interest in Meccano started him on his ideal career and, today, he is a successful engineer with Swiss Railways. His photograph shows a model based on a Loading Grab sited near his workshop, proving that he is still an avid builder in Meccano.

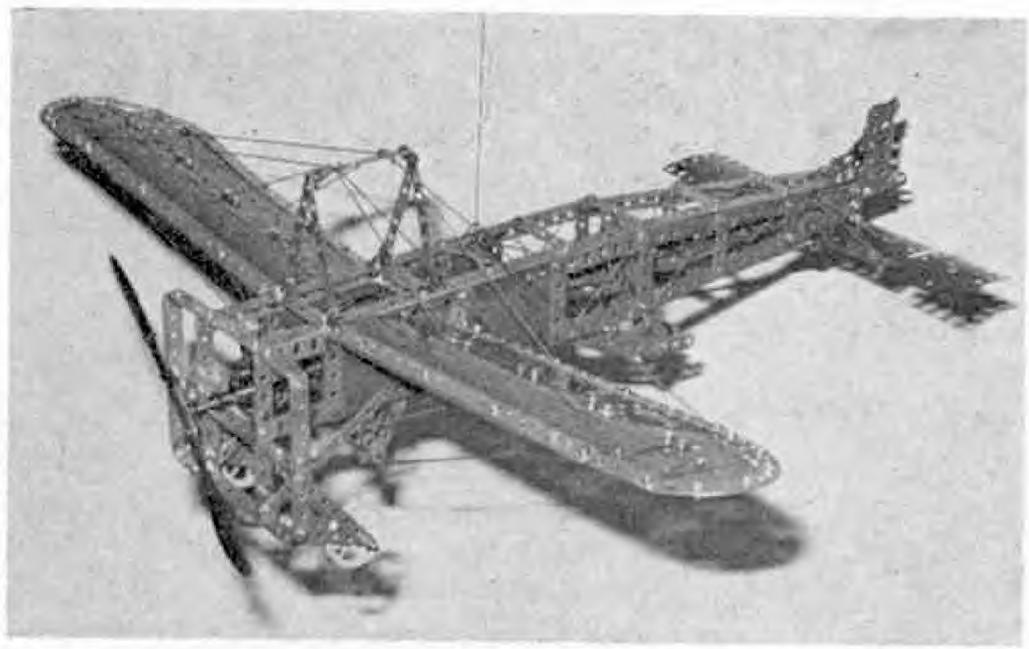
Homeland

Britain, of course, is the homeland of Meccano and, naturally enough, can boast thousands of avid builders. Roger Le Rolland of Stoke-on-Trent is one such individual who is known by readers for his excellent model based on Richard Trevithick's first Steam Carriage which we described in full last November. Included here is a photograph of another " oldie," this time based on the original Bleriot Monoplane in which French aviator Louis Bleriot first flew the English Channel in July 1909.

Although an unusual subject for a Meccano model, Mr. Le Rolland has captured the aircraft extremely well, as students of aircraft history will readily agree. In Mr. Le R's own words, " It features a joystick, which operates the elevator flaps on the tailplane, and also a rudder bar that operates the rudder. It is all Meccano, even the landing wheels being four Steering Wheels, No. 185, with the small headstocks carefully removed for replacement when necessary."

In addition to these features, I understand that the propeller revolves, powered by an Emebo Motor (now obsolete), and this will add that final touch of realism to a very good model. Mr. Le Rolland is to be congratulated.

Another enthusiast who must be congratulated, not only for his models, but also for his excellent work in promoting interest in Meccano, is Mr. Dennis Higginson of Stevenage, Herts. Founder and now Leader of the Stevenage Meccano Club, Mr. Higginson is shown in the accompanying photograph at work on a large Ferris Wheel he was building for a Christmas display in a local shop. Meccano enthusiasts with a good stock of parts at their disposal can often assist local shops in this way and, at the same time, publicise their hobby.



Although based on an unusual subject, this model of a Bleriot Monoplane is remarkably accurate within the limitations of the medium. It's the work of Roger Le Rolland of Stoke-on-Trent, Staffs.

From Two Continents

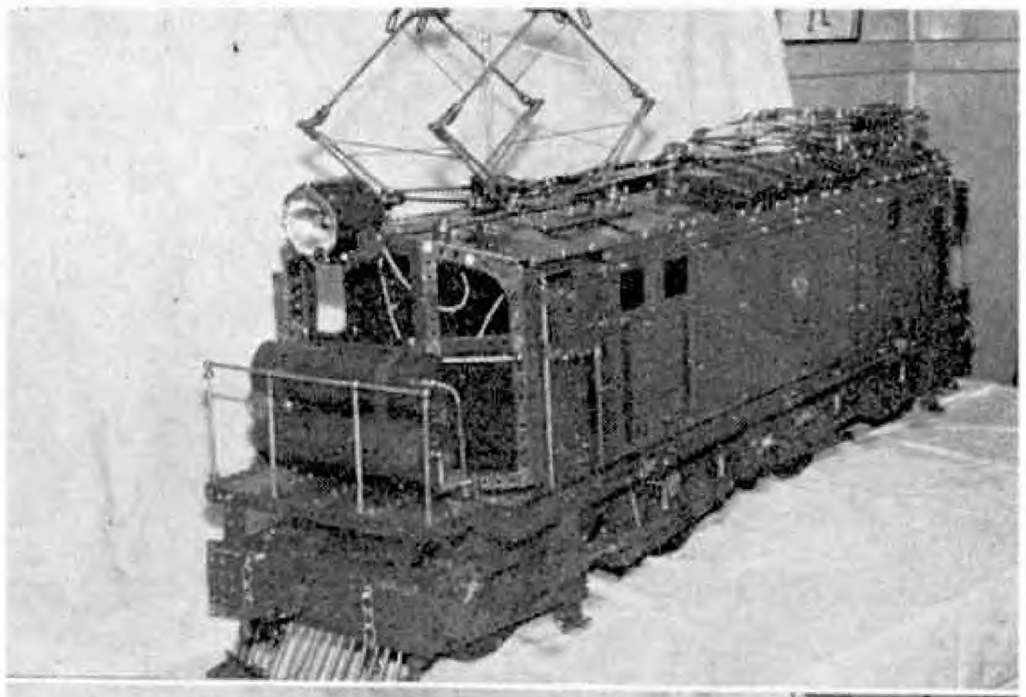
Finally this month I would like to acknowledge the Meccano presence in two other widely-separated continents, Africa and Australia, both of which can claim numerous enthusiasts. Africa, of course, is made up of many different countries, but, on this occasion, I refer to South Africa, represented here by Mr. H. Smith of Port Elizabeth. His illustration shows a really superb Traction Engine which he built for the 1967 Meccano Model-building Contest, and then was unable to enter it as that Contest had to be abandoned owing to the temporary demise of Meccano Magazine ! I'ts unfortunate, because the model would have stood a high chance of success, being a tremendously-detailed and really appealing construction, as I am sure you will agree.

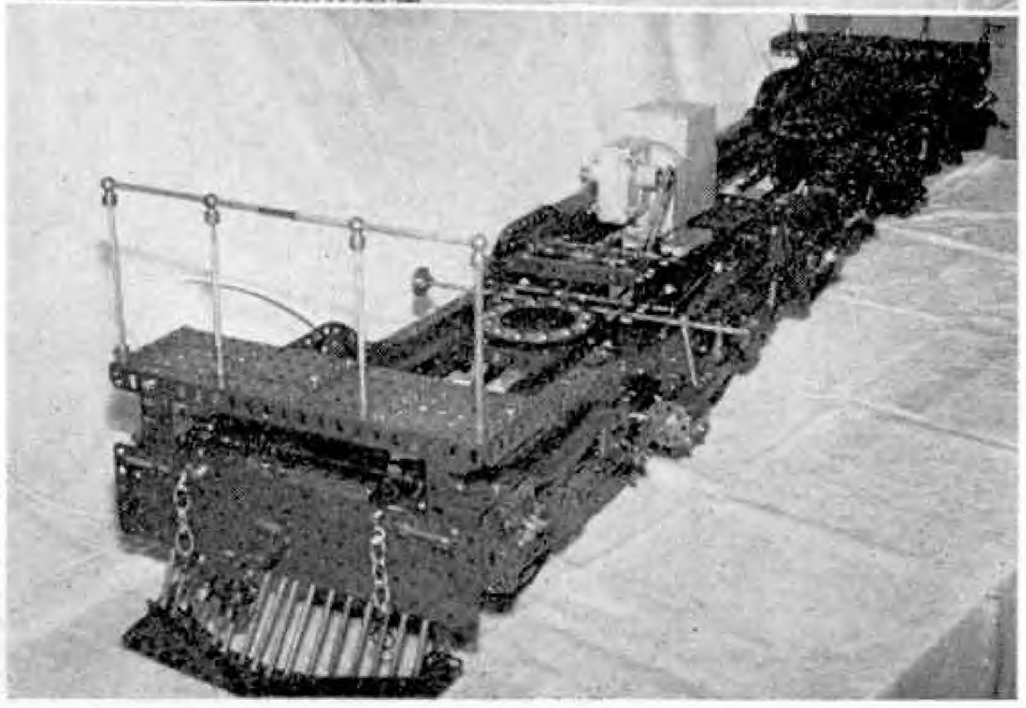
As a matter of interest, Mr. Smith is another builder who was given his first Meccano Set when he was seven years old, only in this case it was in 1942. He tells me that, since then, he has never missed a copy of Meccano Magazine—and still has them all, as well as most of the pre-war Super Model Leaflets and Manuals. This is more than can be said for the M.M. ! While we have copies of all past Magazines, nearly all our files of pre-war Instructions Leaflets and Manuals were destroyed during the war.

Our problems, aside, though, Australia is represented here by Mr. B. R. Kuss of Nambour, Queensland, who has been building Meccano models for many years. I might add, too, that he has turned out a tremendous variety of first-class constructions in his time, many of which we have had the opportunity of seeing—in photographic form. The accompanying illustration shows a large and very well-proportioned tipper truck, and we have chosen this, not because it shows Mr. Kuss' best model, but because the print is the most suitable for reproduction. As Mr. Kuss has himself said, he has difficulty in obtaining good photographic prints where he lives. In any case, it's the model that counts !

In closing, I must stress that all the models illustrated here have been built by M.M. readers who have sent the prints in for our (and your !) interest. We do not have building instructions for any of the models—sorry.

Fine work from New Zealand—the magnificent Ec Electric Locomotive built by S. J. Kennedy of Christchurch and below with the body removed to show the extremely strong and highly-detailed chassis.





TRANSPORT TOPICS

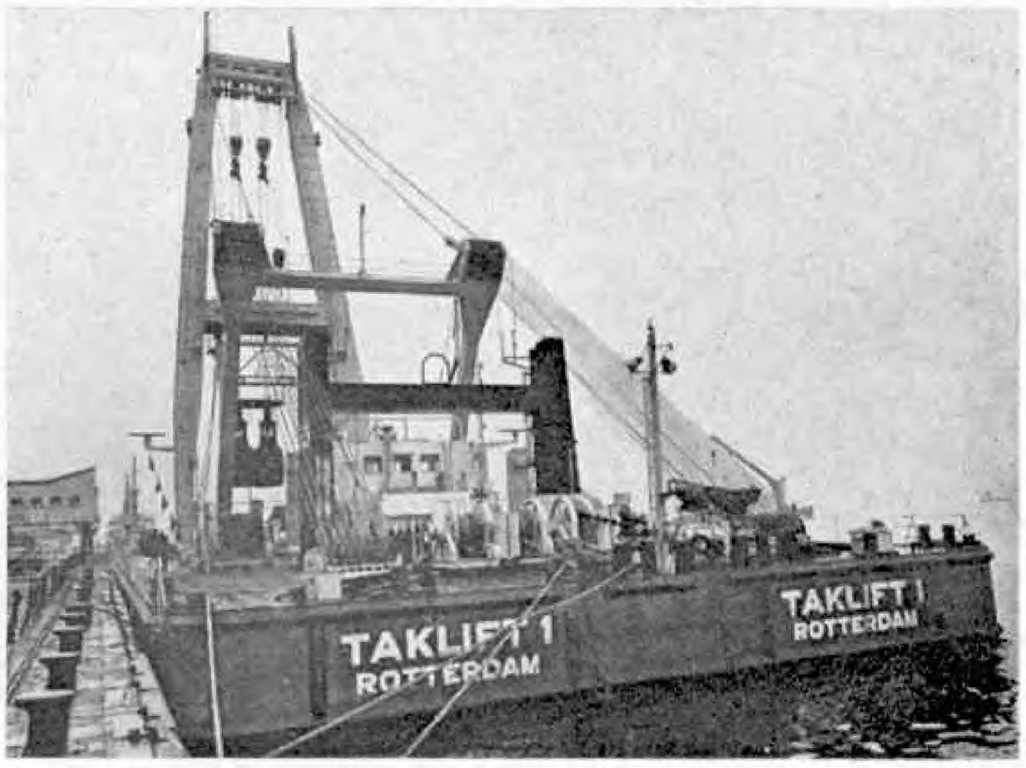
by Mike Rickett

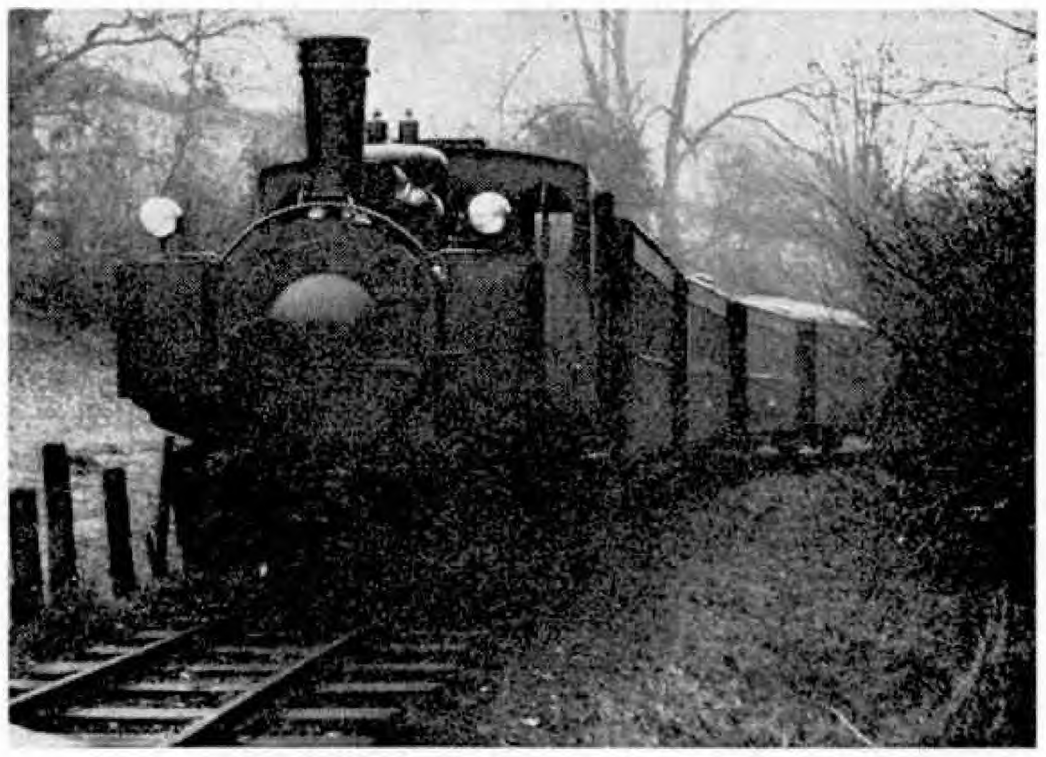
READERS MAY have read in the national papers a few weeks ago about Narborough Station, near Leicester, on the Nottingham-Leicester-Birmingham main line. Closed along with 21 other stations three years ago under the Beeching plan, Narborough is now to have a new lease of life because of the determination of the local council. Ratepayers became so annoyed with the poor transport into Leicester and Birmingham after the station was closed that they persuaded their council to subsidise the cost of re-opening the station, so that commuter trains could begin running once again.

Directly concerned is Mr. Bob Owen who will be solely responsible for issuing tickets, keeping a daily account of all traffic and income, opening the station at 7.15 a.m. and closing it at 6.45 p.m., and cleaning the station as well as whitewashing the platform edges. Once again, trains to both Leicester and Birmingham leave Narborough every morning and return every evening, all thanks to the efforts of the ratepayers—incidentally, the first time in B.R.'s history that ratepayers have subsidised their own service.

On the Southern Region of B.R. a new power signal box now being built at Dartford will eventually be one of 13 which will control all train services on the Region. When completed next year, the one at Dartford will control all trains passing through 30 stations, and look after nearly 100 miles of one of the busiest suburban networks in the world. This box alone will replace 31 existing signal boxes.

The introduction of the new signal box means the conversion to modern colour light signals of all the old semaphore signals on the Greenwich line, the North Kent line via Woolwich, the Bexleyheath line and the Dartford Loop via Sidcup. Colour light signals are also to be installed between Dartford and Strood to link with the area equipped with them in the Kent Coast electrification work of 1959. Altogether, the Southern Region is spending £2,800,000 on the new box just outside Dartford Station and its 257 associated colour light signals, which allow trains to follow one another more closely as well as permit better and safer running in darkness and fog.





During the day there will usually be three signalmen on duty at Dartford at a time. They will work a control panel which is a diagram of the tracks controlled by the box, with push buttons to operate the points and signals. Trains passing through the area will be shown on the diagram by red lights while miniature cathode ray tubes identify each train by a code number. In this way, the signalmen will be able to recognise and control each train long before it comes into sight of the box.

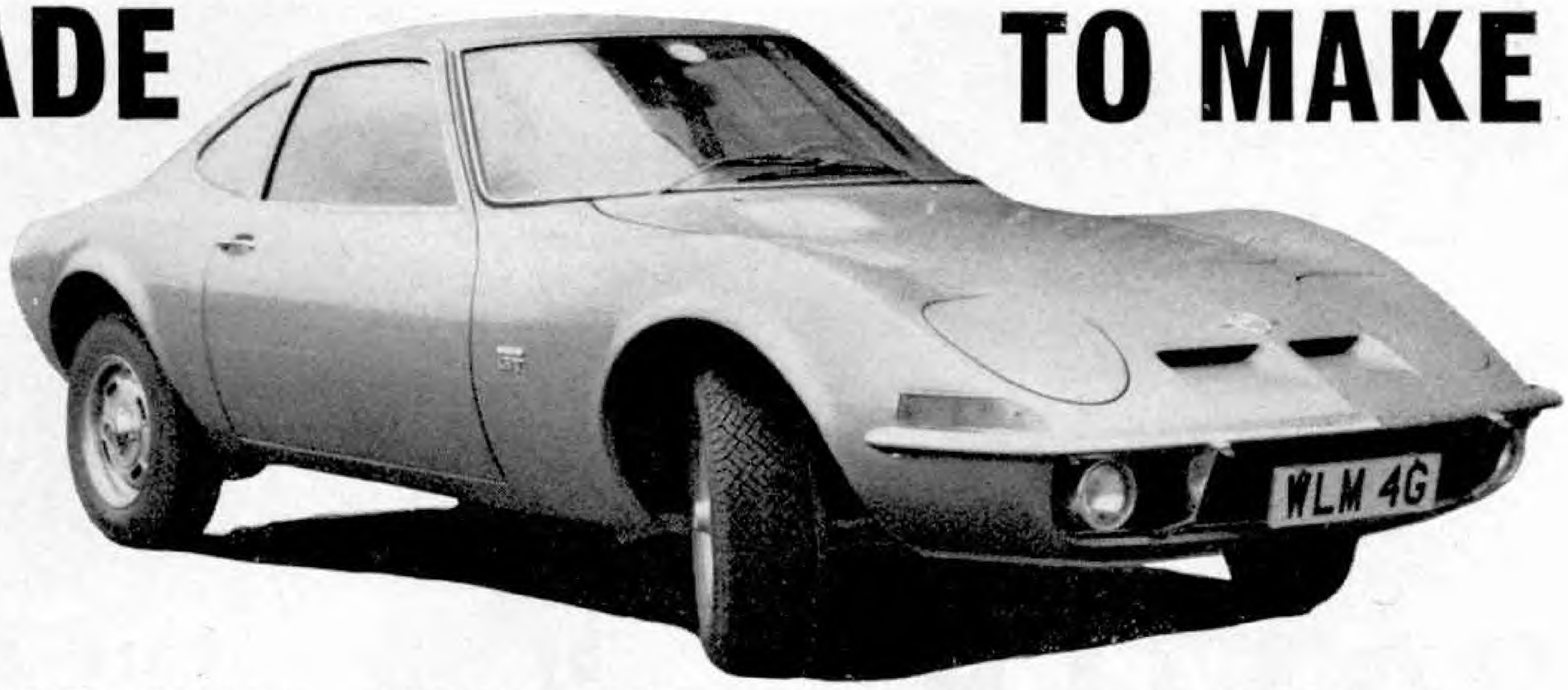
Not quite as modern but successful nevertheless is the Welshpool and Llanfair Railway. For the past seven years a group of volunteers and one full time General Manager have increased its turnover from £300 to £12,000 in 1969, whilst the 1969 operating season produced the record number of 32,000 passengers.

From their headquarters in the tiny and picturesque village of Llanfair Caereinion, nine miles west of Welshpool on the main A458 road, members of the Welshpool and Llanfair Railway Company have firmly established this 2 ft. 6 in. gauge line as one of Mid-Wales' major tourist attractions. In addition to partially re-instating the railway to what it was when originally opened in 1903, they have acquired four passenger coaches from an Austrian railway company, the Zillertalbahn, which is of the same gauge and which runs between Jenbach, near Innsbruck and the famous climbing and ski-ing resort of Meyrhofen. To complete their Austrian train set, the company has succeeded in buying an 0-8-0 steam tank locomotive built in 1944 by Franco-Belge of France, one of many used by the German Military field railways in Europe and on the Russian front. After the war, it was acquired by the Salzkammergut Lokalbahn, Austria, and resold in 1957 to the Steiermarkische Landesbahnen near Graz. The locomotive left Weis in Austria by road low loader on 4th December, 1969, and took five days to reach Llanfair Caereinion via the Amsterdam-Immingham sea crossing, the carriers being Schenkers Ltd. of London who confess that it was their most unusual load ever.

After various small adjustments and a boiler hydraulic test, the locomotive will be in regular service on the Welshpool and Llanfair Light railway in June, so if you happen to visit North Wales, why not go and have a look?

Finally, I include a photograph of a Dutch salvage crane at the moment in use on the River Mersey for salvaging wrecks. One of the largest of its kind in Europe, the crane has already lifted two wrecks from the bed of the River, one of which sank as long ago as 1896.

MADE TO MAKE



YOUR MOUTH WATER !

ISN'T IT a beauty ? This car is one of the very few that start life as a design exercise and go on to become a normal production model.

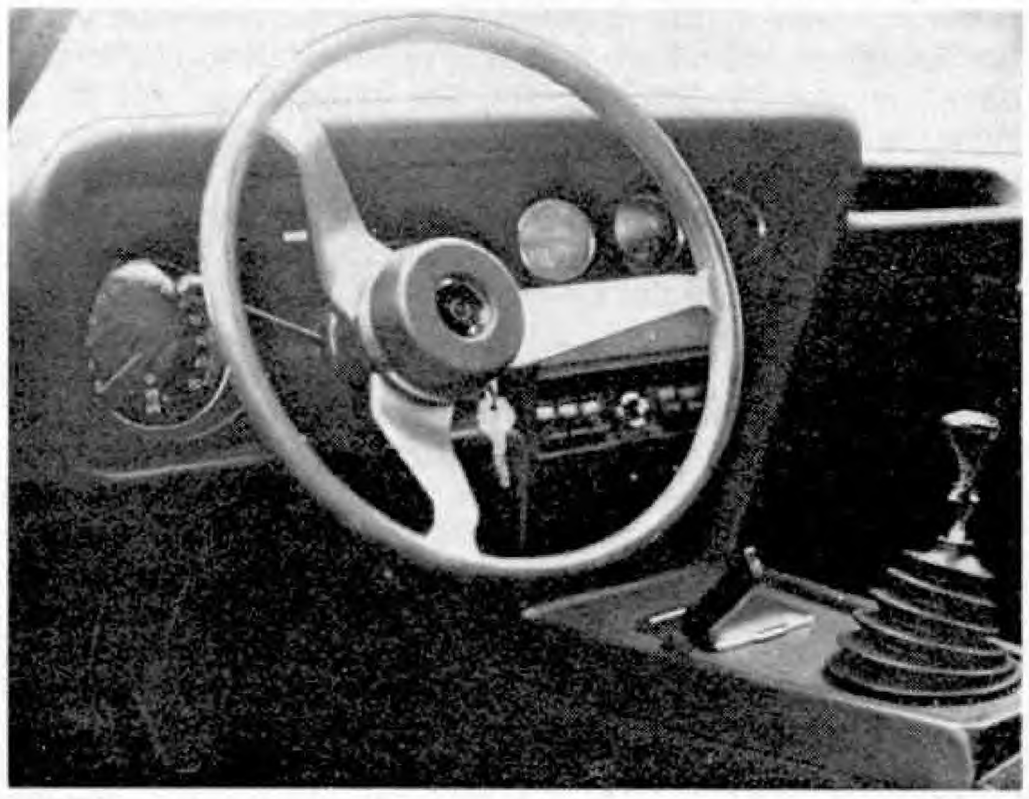
Built by the Opel Car division of the American owned General Motors Company, it is called quite simply the Opel G.T. A choice of two engines are offered, 1100 c.c. and 1900 c.c., the former giving it a top speed of 95 m.p.h. and the latter 110 m.p.h.

Apart from its distinctive shape it has a few rather novel features which include extended seat backs to prevent " whiplash " in the event of an accident. Instruments that are arranged in an arc around the driver for easier observation, and roll-over headlights operated by a small lever on the console between the seats.

It has of course many other extras such as a heated rear window, cigarette lighter, fingertip controlled electric windscreen washers, etc.; all helping to make it a very up to the minute piece of sporting machinery.

For our money it is the most attractive sports car around at present, and talking of money . . .

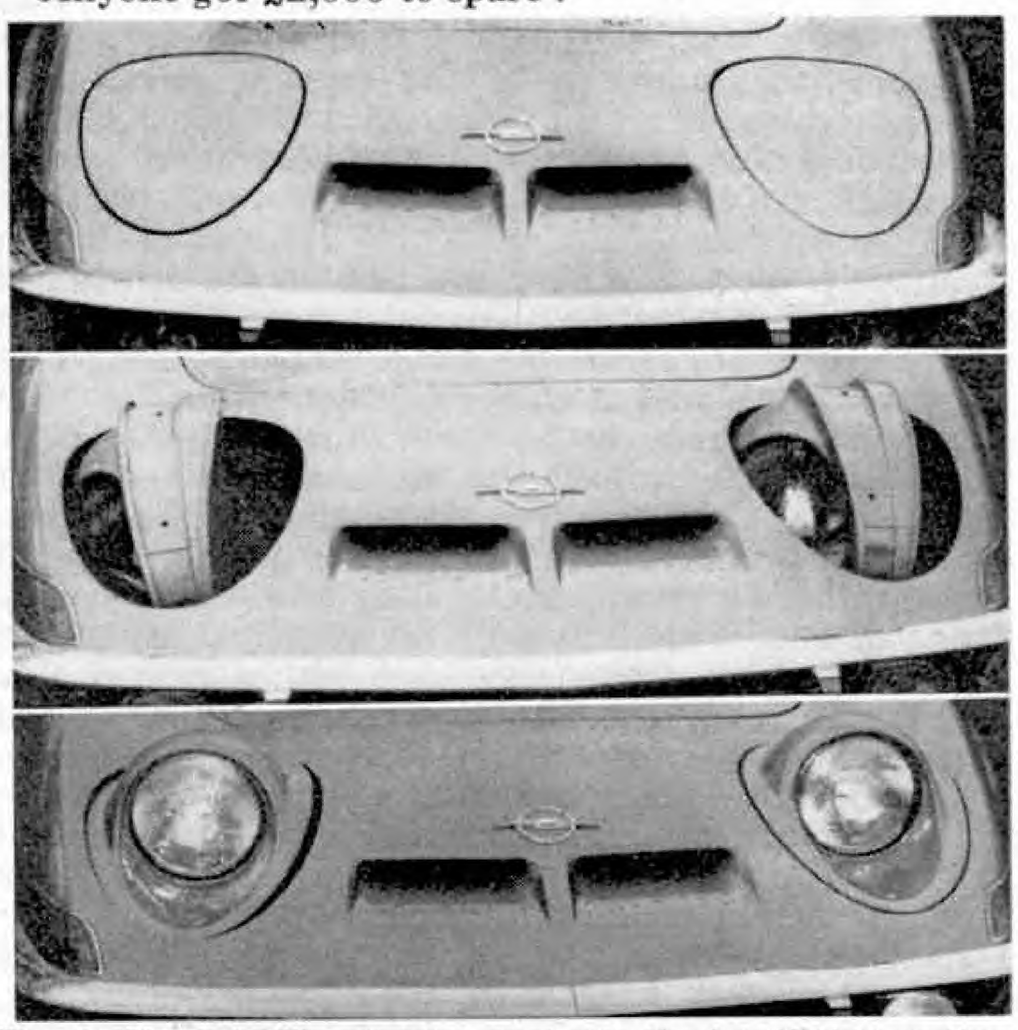
Anyone got £2,000 to spare ?



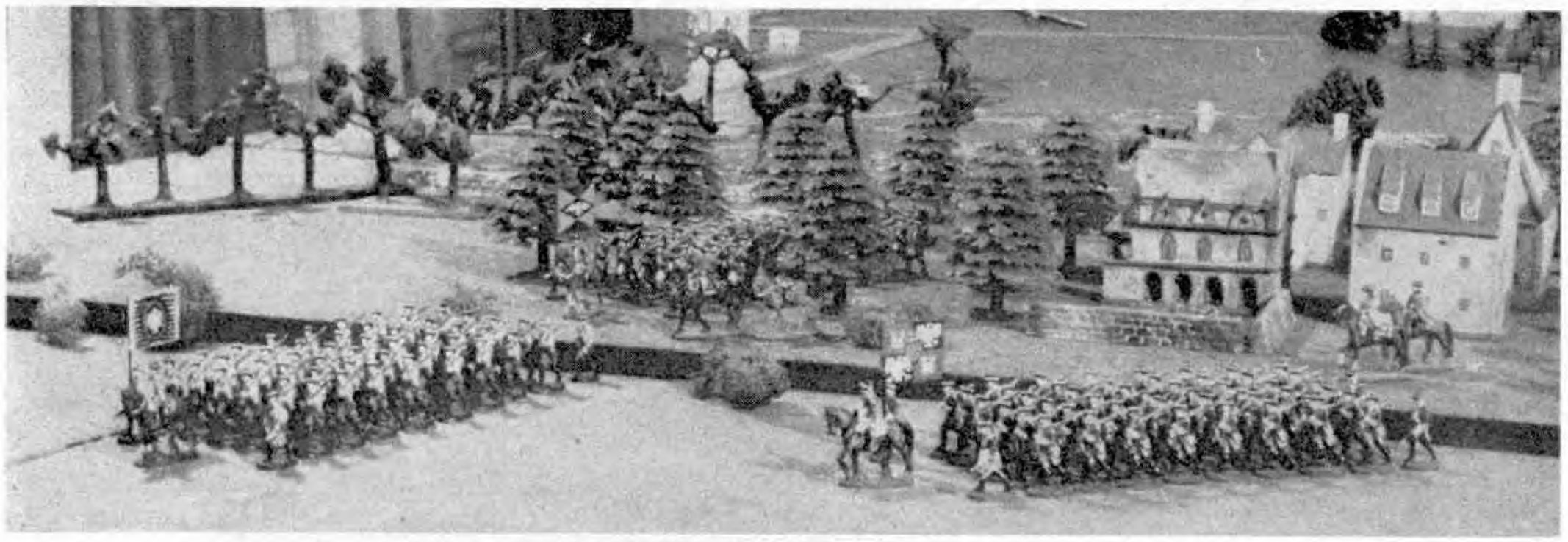
With instruments grouped around the driver, sitting in the G.T. is more like sitting in an aircraft. The small black lever in front of the gearstick is the control for the roll-over headlights.



The smooth futuristic lines spread right round to the rear of this little bomb. Note the cut-off rear.



Top to Bottom: The camera captures the headlights as they roll over, automatically switching on as they lock into position. The time taken from close to open is just over a second!



BATTLE

by Charles Grant

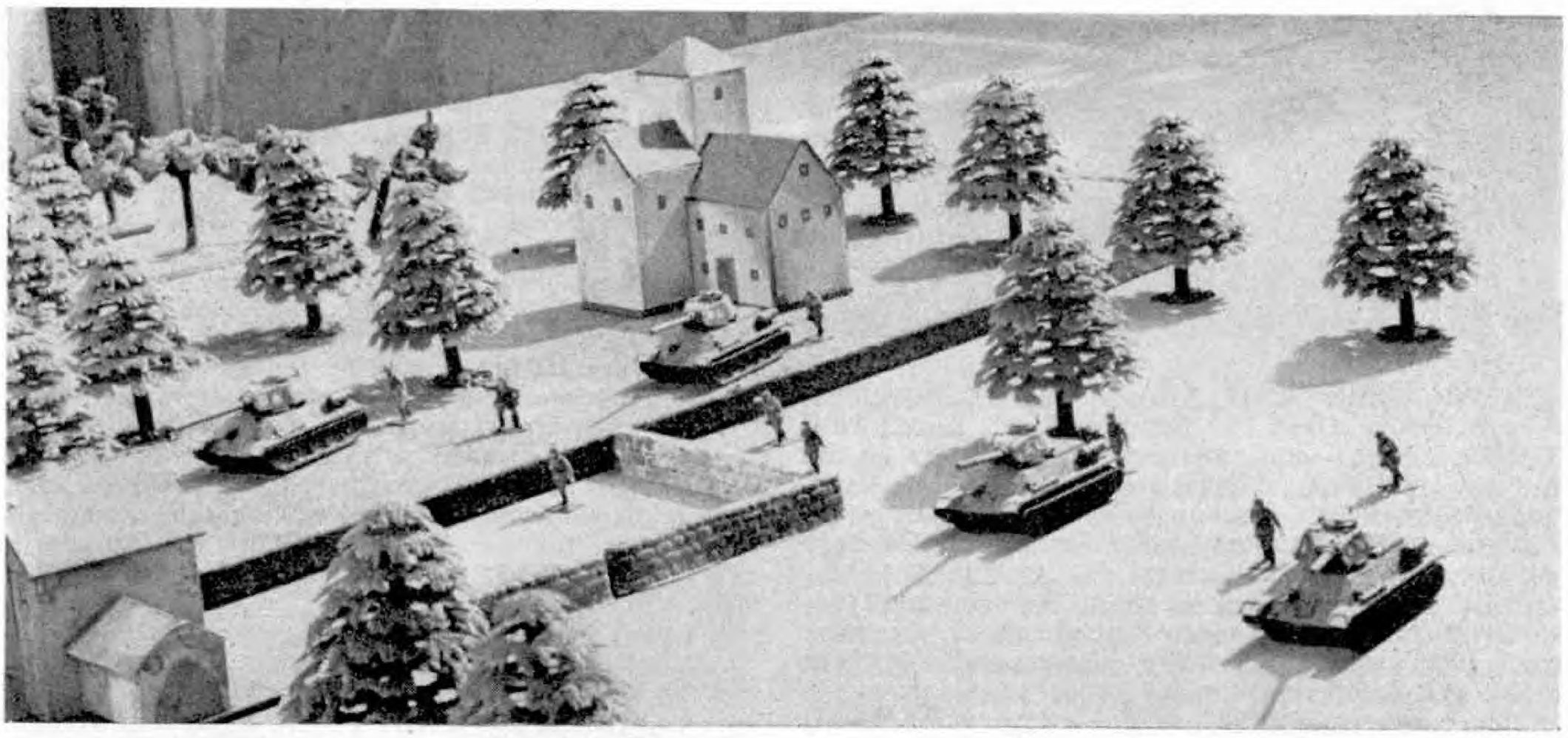
Part XXIV 'MORALE'

IT MAY NOT have escaped the notice of the keen-eyed reader that something of considerable significance occurred during the narrative of the reconnaissance in force which took place in Part XXIII. This, of course, was the occasion when RED's 'B' Coy. infantry, advancing against the enemy in ROUND WOOD, suffered very severely from BLACK's artillery and rifle fire. Without going into details, it will be recalled that the survivors of the company were pulled back and took no further part in the action. Perhaps it might be asked what the reason was for this taking place and why the company was not used aggressively during the remainder of the fighting. The answer can be expressed in one word—Morale. What we have to do now is to discuss what this is all about, and what effect morale—or the lack of it—has on troops in the wargame.

First of all, let us consider what it means. Now, we do not have to be graduates of the Staff College to know that soldiers, of no matter which nation and in no matter which period of warfare, did not always do exactly what was expected of them. Time was in wargames, before some of the present refinements were introduced in recent years, when the two opposing sides would slug it out until the game finished with a couple of men left standing on one side, and with the other totally annihilated. This, of course, was a completely unreal situation and had no relationship at all to what happened in 'the real thing.' If indeed it were so, it would inevitably mean that the stronger or more numerous side in any engagement would without any question prove to be the victorious one. Now this is very far from being necessarily so—look at Lord Wavell's first Libyan Campaign. There is a classic example of David beating the daylights out of Goliath, or of a small force beating a much larger one hands down. This is one of the principal aspects of the morale thing, where the chaps with plenty of guts knock out a vastly greater number of men who, for one reason or another, don't have their hearts in the job. Of course there are other aspects to be considered—training, experience, fitness, and so on—but the point I'm trying to make is that, all things being equal, the men with higher morale will generally prevail.

At different periods of military history not always the same factors were involved in determining the morale of troops, and in those different eras we have to examine all sorts of things in connection with this, and even at times the political background to the war with which we are concerned. Take the troops who fought for the South—the Confederacy—during the American Civil War. Certainly in the earlier stages of this conflict at least, the near fanaticism of 'Johnny Reb' was something which vastly increased his fighting power, but characteristically, we find that soldiers of this type who can perform wonders of bravery can, in contrast—and it has happened many times—suddenly, for no apparent reason, bolt like rabbits, although within days, or possibly even hours, the same men will be as right as rain and ready for anything. A century or more before the American Civil War—in the time of Frederick the Great—things were different again. The Prussian and other continental troops were drilled and regimented to such an extent that the men were practically unthinking automatons. They endured heavy losses in action without flinching, so long as there was a sufficiency of control, that is, plenty of officers and N.C.O.'s, to see that orders were carried out. However, once casualties among the officers had mounted to such an extent that control started to slip, then the men were 'off' and it was a near impossible undertaking to get them back in line. Of course, the troops of yesterday—I mean the early 19th Century, the 18th Century and even earlier—had rather more to put up with in respect to the visual inpact of casualties than their modern counterparts normally do. The men at Blenheim, Zorndorf and Waterloo saw more in the way of heaps of casualties then ordinarily is the case in modern warfare where concealment and dispersion reduces the effect of this sort of thing.

The sum total of all the foregoing is that, if one wishes to give some degree of realism to one's wargame, appropriate allowance had to be made for this intangible quality of morale and for the occasional inexplicable and irrational behaviour of troops in the field, whether it be panic flight or a simple refusal to carry out orders. If one wants to go into this sort of thing really deeply, a whole host of influences will have to be considered—fatigue, whether or not the men are hungry or thirsty, what sort of leaders they have, have they been winning or losing previously, and so on and so on. Possibly our period—World War II—is the least easy of any era of warfare to lay down an easily workable morale rule, and this for a number of reasons. Of these the most important probably is that individual training—for the single soldier of any rank, that is—has been brought to a far higher pitch of perfection than was the case in



The two photographs illustrate the point made in the text relative to morale in different periods: the 18th Century infantry advancing in solid blocks while their present-day counterparts are in very extended order.

armies of a hundred years or more ago, when the infantryman had not much more to learn than his drill movements, his musket exercise, and how to stand in line until he dropped or was ordered to advance or retire. On the contrary, the present-day 'thinking' soldier is expected to employ all the skills taught him throughout lengthy training, plus initiative and intelligence to cope with any sort of situation, even if out of touch with officers or totally isolated and far from the remainder of his unit. An 18th Century regiment, standing in line 'in close order for firing' can be fairly readily assessed morale-wise, while for a 1944 unit, scattered all over the countryside, with the men lurking behind bushes, ensconced in fox-holes, or hidden in ruined buildings, it is an entirely more complicated matter. Obviously, in such circumstances it cannot be a question, at one fell swoop, of using a rule to ascertain the state of mind of a battalion or a regiment, and we shall have to split the larger unit up into smaller entities in determining morale and to decide in what circumstances this will, in fact, have to be done.

In all this we shall have to do our best not to make the system too complicated, and to develop some sort of rule of thumb where speed of reaching a decision about the morale of a certain group can be combined with achieving realism in its behaviour. We shall have to devote some thought on how to sum up the two sorts of factors involved—the material and the intangible—the latter being probably the more obvious. As far as our wargame is concerned it will be done—just as the determination of morale is made for any sort of regiment in any period of warfare—by a dice throw, and of this we shall speak more anon.

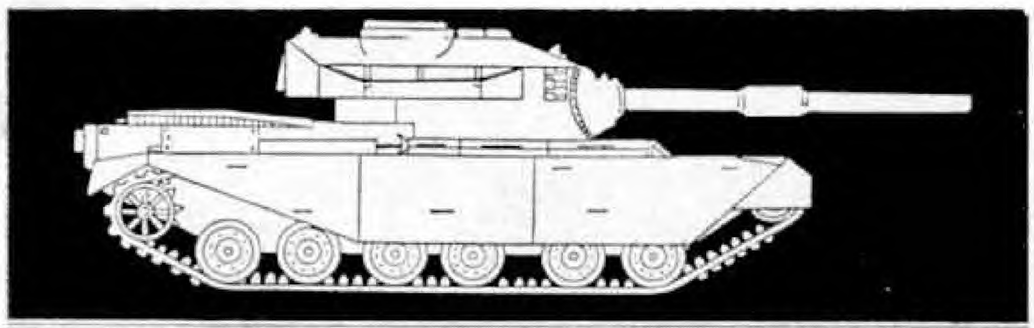
The material points which might be considered are literally legion. Some of them have already been indicated—fatigue, quality of training and so on, but in accordance with my oft-expressed thesis that our wargame rules should err rather on the side of simplicity than in the other direction, we shall keep them as uncomplicated as possible, the idea being always at the back of one's mind that the present rules can act as a foundation upon which, if desired, a more complex or elaborate structure may be erected. So we shall briefly list and discuss the various factors which, combined with a dice throw, we shall take account of when proceeding to make an assessment of the morale of a group of soldiers, and also when, and in what circumstances it will be required to make such an assessment.

Let me list them the factors which will in some measure affect the morale of our unit and say a few words on each. First, the obvious one will be the presence or absence of the controlling body, which will be the officer and N.C.O. elements, whether one or both be applicable to the group we are considering. Obviously if both are casualties this will have a pretty marked effect even on our highly trained infantrymen. Next, the question will be one of protection—the partial immunity afforded by hard or soft cover will certainly influence the troops and determine how safe they can consider themselves. Whether or not our chaps are in communication with higher authority for orders and information is highly important, if this be visually, by word of mouth or by radio, and this factor will operate irrespective of the presence of officer or N.C.O. Very important, needless to say, is the number of casualties the group has suffered—morale will be lower in proportion to the number who have fallen in action. Finally, as a special case (although it will frequently apply to our motorised infantry, or indeed to any carried in Armoured Personnel Carriers) the survivors of any carrier-borne infantry until will have to have the destruction of their vehicle taken into consideration. Men who have just scrambled out of a 'brewed-up' half-track, for instance, will be pretty shaken, there is no doubt at all.

These then are the bare bones of the points we shall consider in the question of establishing morale, and the list reads—

(1) Control.
(2) Cover.
(3) Communication.
(4) Casualties.
(5) If vehicle destroyed.

These are the headings under which we shall discuss morale and arrive, we hope, at a General Morale Rule to cover the problem.



MILITARIA

A REVIEW BY CHARLES GRANT

FROM ARMS AND ARMOUR PRESS (Lionel Leventhal Ltd., 677 Finchley Road, Childs Hill, London N.W.2) come two rather lush volumes for the military enthusiast—" Dress Regulations for the Army, 1900," with an introduction by W. Y. Carman, of the National Army Museum, and " British Smooth-Bore Artillery " by Major General B. P. Hughes, C.B., C.B.E. Both books are really for the specialist, particularly the former, which reproduces in the most meticulous detail every article of uniform and equipment relative to the period covered—1900 or thereabouts—what might be called the ' classic ' period of the British Army uniform. Here we have details of braid and badges, mess jackets and sabres, belts and epaulettes—you name it, it's there—and every illustration is accompanied by exhaustive descriptions. As I said, this is a particularly specialised tome for the military collector and, to a lesser extent, for the model maker, and the price—60s.—is not too high for the wealth of information it provides. Major General Hughes' work, although pretty technical, could have a very much wider reading public, and for the wargamer it really furnishes a tremendous amount of information. What I especially like about the book is the fact that it is extremely readable. One can simply open it at any point and read whatever text is revealed without difficulty and with great enjoyment. Not to be forgotten are the many first rate illustrations, as well as many highly detailed line drawings of guns, limbers, caissons and so on. For the modelmaker, and above all for the wargamer in the smooth-bore period (" horse and musket ")—and this was a very lengthy era—I can recommend this book without reservation, despite its cost of 85s. It is worth saving up for, if only to have details of some of the more outlandish forms of artillery, camel batteries, mountain guns, and wonder of wonders, seige guns drawn by elephants ! Great for a wargame, don't you think ?

One is lead on quite naturally from this book to the splendid 54 mm. scale model guns made by HINCHCLIFFE MODELS (of 83 Wessenden Head Road, Meltham, Yorkshire). These are cast in metal in the most exquisite detail and include all the great pieces of ordnance of the 19th Century and later, including guns of the French Gribeauval system, the British 18-pounder of World War I, and many others. The models come in kit form and, assembled and painted with the attention and care they merit, the finished products are absolute gems, fit for any connoisseur's shelf. They can be matched up as is appropriate with the 54 mm. artillerymen as supplied by Norman Newton Ltd., and the resulting groups would provide something out of this world. Every detail of each gun is painstakingly reproduced—buckets, rammers,

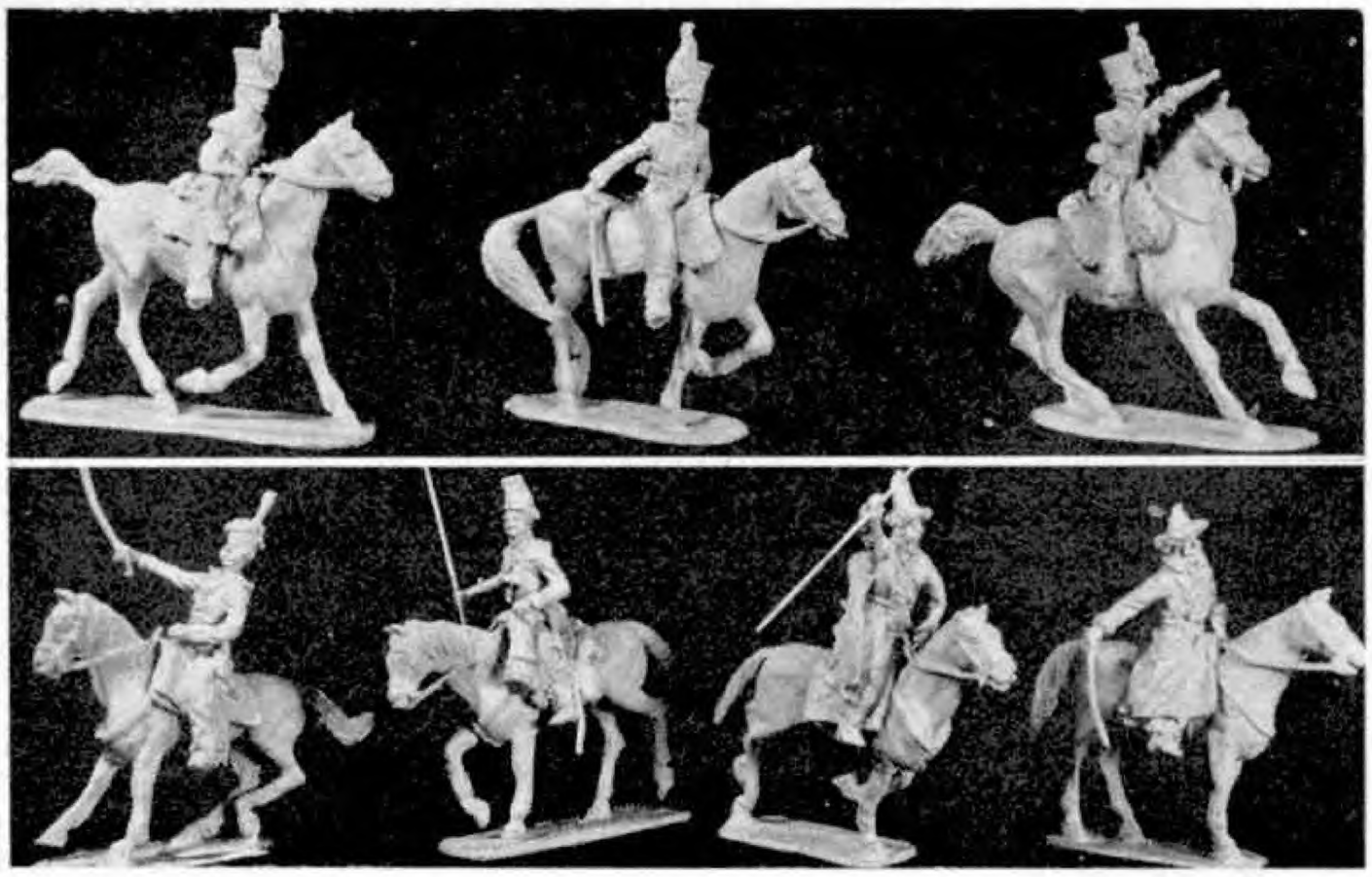


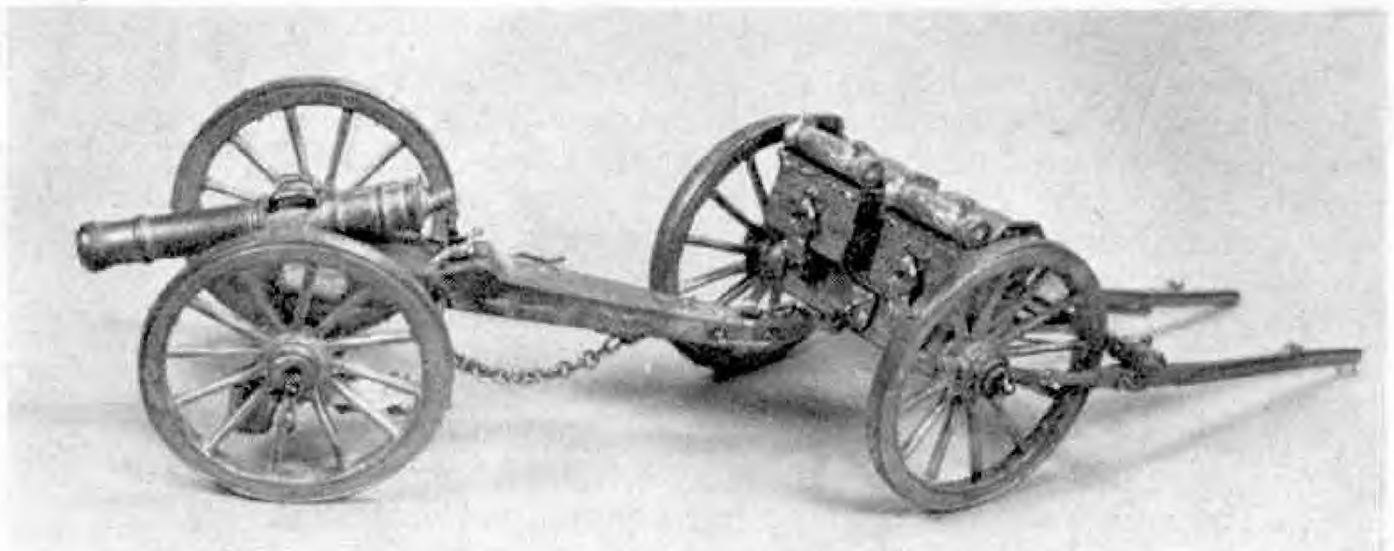
Above: Napoleonic period 20 mm wargame figures from Greenwood and Ball.

Below left: One of the latest publications from Arms and Armour Press.

Below: " Willie Figures " cavalry of the Napoleonic period —Russian and Brunswick. The best that can be obtained in 30 mm size without a doubt.







One of the splendid pieces of artillery in the 54 mm. scale by Hinchcliffe Models—the detail of casting is first rate.

chains, etc.—and we can even see the graining of these parts simulating wood in the trails, etc. To give the reader an idea of what it's all about, we illustrate a 9-pounder and limber, really great, without a doubt. Prices range from 17s. 5d. for a British 32-pounder carronade to £3 4s. 5d. for the 18-pounder already mentioned, and there is also a Waterloo 9-pounder gun and limber in 30 mm. size—very nice, too.

A most useful piece of wargaming terrain, in the Bellona Series, comes from MERBERLEN LTD. (Badgers Mead, Hawthorn Hill, Bracknell, Berkshire), this being their latest ' diorama,' No. D 8, a fortified beach with concrete gun emplacement. This is designed to be used in modern amphibious operations (it comes in a light sand coloured phastic) but like all the firm's products it could be used for all sorts of purposes. Trenches and small bunkers are included in the piece, together with a major concrete bunker with removable roof. The firm suggests that an 88 mm. gun could be installed therein, but I have used this particular diorama as a field fortification in circumstances very remote from ' 1939 onwards,' which it is designed for—how about the French redoubts at Fontenoy, for example ? Just a thought, but enough to show the versatility of the diorama. Cost is moderate—11s. 3d.—plus postage and packing, of course, A good buy.

I'd like to call attention to the " Wargame Rules 1000 B.C. to 500 A.D.," which I have already mentioned in these pages (" Meccano Magazine," August, 1969), and of which a second edition has been issued. This contains important and useful revisions—number of ranks taking part in melee, choice of weapons for multi-weaponed troops are but two of these—and the Rules are now really excellent. I have enjoyed a number of exciting games under them—in one I even had the temerity to defeat, albeit by a narrow margin, one of the authors himself—no mean feat, I thought. (Apologies for any immodesty.) Another set of rules I can recommend has been published by the Society of Ancients, these being " Medieval Siege Rules " by J. L. Mumford. I know very little about medieval warfare, in fact it's probably one of the few periods in which I have never played a game, but I have seen ' Slim ' Mumford's rules in operation and without a doubt they provide a splendid and interesting game. Included are basic rules for medieval field warfare, and the only possible criticism is that they err on the side of brevity, and here and there a little effort is required to follow them, but this is a very minor ' beef.' They cost 5s. plus postage and are obtainable from Neville Dickinson, 25 Rutland Road, Bitterne, Southampton. The ' ancient ' rules can be had from Bob O'Brien, 75 Ardingley Drive, Goring-by-Sea, Sussex—cost 8s.

And now for some model soldiers, the first of these being a selection of really superb cavalry produced by " WILLIE FIGURES " (E. Suren, 60 Lower Sloane Street, London S.W.1). These are in the 30 mm. size (actually they are a shade bigger, being more like 35 mm.) and for the collector of really first class figure, this size can well provide the answer to the problem of cost in this day and age, when the craftsman-made 54 mm. figure may well be too expensive for the ordinary collector. ' Ted ' Suren's figures are so incredibly well detailed and have such character in face and posture that a collection of them on one's display shelves would draw all eyes without a doubt. Those shown are Cossacks and Kalmucks of the Russian Army—wild looking characters they are—and Brunswick Cavalry—both of the Napoleonic period. They give a splendid idea of the quality of the figures. Have a look at the horses—they really are tremendous. Cavalry figures cost 14s. each and they are worth every penny.

In the last " Militaria " I spoke of the possibility of 20 mm. Napoleonic figures in metal from GREENWOOD AND BALL (Martinhoe, East End Way, Pinner, Middlesex) and here they are—the four excellent types shown in the photograph, equal in every respect to the firm's line of ' ancients.' There are the three different types of French infantrymen—grenadier, voltigeur and fusilier, and a Highlander, all of the Napoleonic period. The Highlander is a really good figure (although I have probably certain national prejudices). The figures are all that can de desired, and the particular attitude in which they are cast—a sort of advancing ' high port '—is about the best posture for a wargame figure, or I believe so, anyway. Price of the figure is 1s. 3d., and I daresay we shall be having the traditional British infantry in shakos before long, together with other types for Napoleonic wargaming—they should be pretty good.



" British Smooth Bore Artillery " the second new publication from Arms and Armour Press.

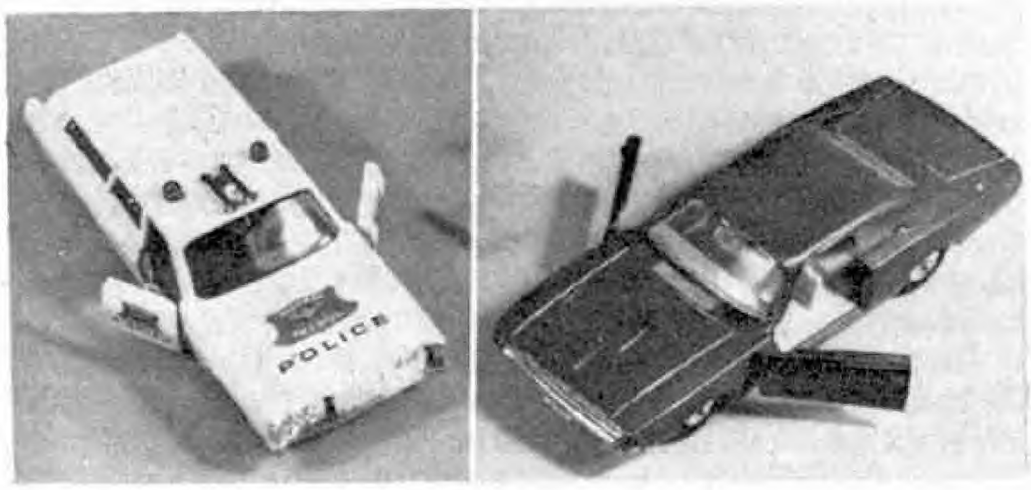
Matchbox "Kingsize"

The two latest models in the Matchbox Kingsize range are a Dodge Charger and a Mercury Police Car, both of course based on full-size American Cars. Both models feature the new "Autosteer" steering unit, a very clever device which turns the front wheels when when any attempt is made to "turn" the car.

The "Charger" has a full detailed interior finished in light blue, and has opening doors. Outside the model is finished in a beautiful metallic Royal Blue, and this coupled with the lighter blue interior and chromium radiator etc. makes it a very attractive car.

The Police Car also has opening front doors, revealing a brilliant red, fully detailed interior. Outside the model is finished in brilliant white with twin blue "flashing" lamps on either side at the front of the roof. Between these are chromium plated two-tone horns. To complete its overall appearance "Police" transfers are fitted to both front doors and the bonnet.

Both models cost 7s. 6d. each, certainly good value. Manufacturers: Lesney Products.



A.S.I. Paratrooper

Rather out of the ordinary for the review column, but nevertheless of interest to many of our readers are air rifles, and as we had an air rifle feature in the March issue we thought it might be a good idea to include one in this month's reviews.

The A.S.I. Paratrooper is an attractive weapon; the "pistol-grip" type of handgrip accounts largely for this. Its a heavy rifle by our reckoning, weighing a total of 6½ lbs. Our sample took a .22 slug and we found it very accurate at short distance target shooting. Above 40 ft. it tends to be rather erratic, the slug dropping rapidly, and loosing most of its velocity. A "blade" foresight and standard backsight (adjustable for elevation and windage) enabled the rifle to be sighted in accurately, especially at distances less than 40 ft.

Although heavy the "Paratrooper' is well balanced and comfortable to use. It is intended for right-handed users, and your Editor (left-handed) found the shaped pistol grip and shaped stock rather awkward to use.



HAVE YOU SEEN ?

All others who were right-handed found it satisfactory.

To summarise, an accurate, attractive rifle, well finished and powerful.

Manufacturer: A.S.I.

Price: Approximately £12 12s. 0d.

New Corgis

We've just received no less than three new models from Corgi, all of which are beautifully finished and well detailed, up to the usual excellent standard Corgi are achieving these days.

The first, a "Corgi Major", is a superb model of a Mercedes Benz Unimog tractor coupled to a 10-ton brilliant yellow, red and metallic charcoal grey goose neck dumper which is very well detailed. The cab interior is completed with seats and steering wheel in red plastic, contrasting with the yellow cab. Twin rear-view mirrors flexible black plastic with chromed "glass" are neat and practical without being clumsy. Jewelled headlights are an attractive point on the radiator, flanking the chromed Mercedes star.

The underside of the Unimog is a wealth of detail. Chromed driving shafts to front and rear axles and working coil springs on all four tractor tyre shod wheels. Other details include, fuel tank, spare wheel, and towing hook.

The Goose Neck trailer fits to the tractor simply by pressing a "ball" connection on it into a spring loaded



clamp on the tractor unit. The trailer, finished in brilliant red and yellow to match the cab has an operational "tipper" and twin simulated hydraulic booms. It is shod with larger wheels and tyres than the Unimog, although they are of the same type.

This is one of the nicest die-casts we have seen recently and represents excellent value at 13s. 6d.

The second Corgi is also one of the "Major" series, although a rather different type of model, being a giant Articulated Scammell Lorry of the type used by International Hauliers.

Dealing firstly with the lorry, this is a Scammell Handyman Mk. 3 and is finished in yellow and white. As with the Unimog the interior is well detailed in red plastic and is of course complete with steering wheel.

Far column centre: The Dodge Charger and Mercury Police Car from Matchbox.

Far column below: The A.S.I. Paratrooper Air Rifle.

Left: The new Corgi Scammell Lorry.

Right: The Corgi Unimog and trailer.

Below left: The Paddle Wagon, once again from Corgi.

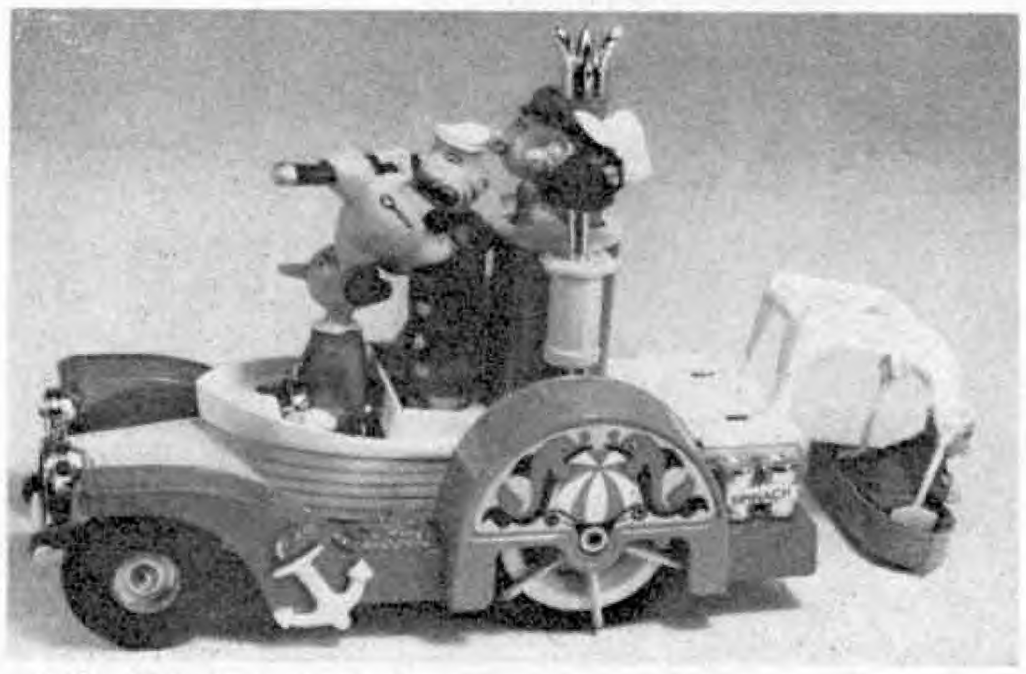
Below right: The A.N.T.E.X. soldering iron.



Outside the most eye-catching features are the inclusion of twin pairs of jewelled headlamps and chromed well detailed wheels. Each wheel is independently sprung and fitted with nicely moulded tyres.

The articulated trailer is a wealth of interest. All four sets of double rear wheels are sprung, and the front set of support wheels can be raised and lowered. The cab unit automatically becomes locked to the trailer and can only be released by operating a small lever on the latter. The simulated tarpaulin covers on the trailer are yellow matching the trailer itself, and both are removable.

The price of this one is 21. 6d.



The third and final new model is one of the Corgi Comic range, being in fact Popeye's Paddle Wagon !

This is one for the youngsters, and a very colourful model it is, with a wealth of moving parts.

All the popular figures from the Popeye cartoons are here; Popeye himself armed with a spyglass (he swings from left to right as the model is pushed forwards), ' Olive Oil ' at the ships wheels (she rolls from side to side); ' Bluto ' and ' Wimpy's ' heads form the piston tops (they bob slowly up and down); last but not least is baby " Swee' Pea " (he sits in a lifeboat at the rear which can be swung down to the ground).

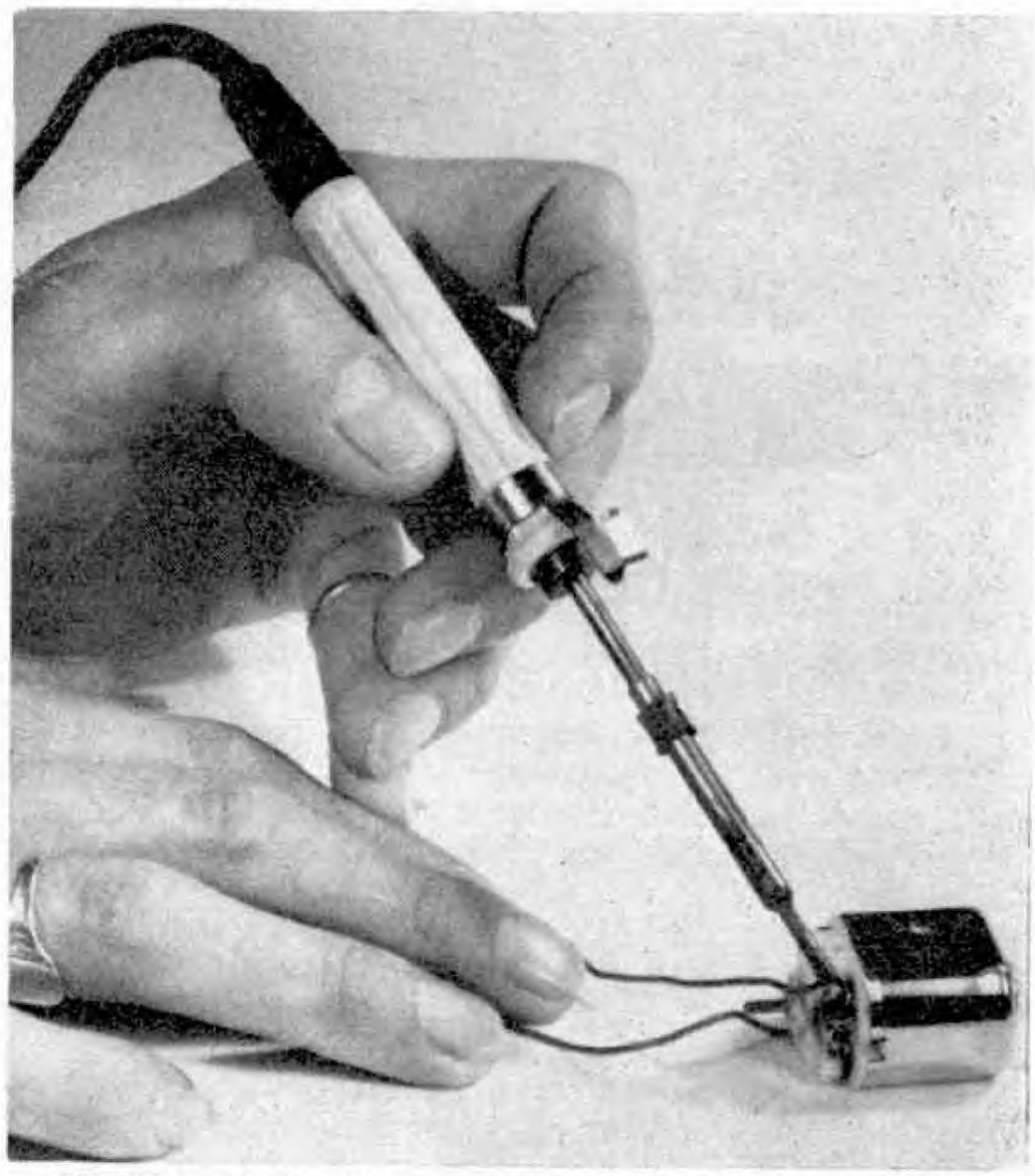
The model is large, strong and very colourful in red, mustard yellow, blue, white and chromium and sports the largest pair of jewelled headlamps we've ever seen.

Price of this little beauty is 25s.

Antex Soldering Iron

Most modellers, and certainly all owners of Model Car Racing Sets or Railway Layouts, will need at some time the use of a soldering iron. We usually find that when the need arises to make running repairs on our models we've never got anything other than a large iron, impossible to use on small components. Most people it seems, go for the biggest iron available in the mistaken opinion that it can do any job, large or small. Those of you who have attempted to use a " Poker " sized iron on small parts will appreciate what we mean when we say that it is just impossible to carry out a neat job !

This of course brings us on to the subject of this review, a new neat little soldering iron from the Devon based firm of Antex.



Designated the CN220, our particular sample is one of a staggeringly large range available from the firm, and is ideal for the variety of small jobs a modeller has to do. The CN220 measures a mere 6½ inches in length and weighing an ounce, is a true lightweight and is available in a number of voltage specifications to suit mains supplies everywhere. The " bit " of the iron as supplied is a pointed one for general use and there are no less than four alternatives available.

A very useful " extra " is the inclusion of a small chromium plated hook for hanging the iron on to any suitable shelf, etc. The CN220 takes approximately a minute to heat up to working temperature, and for its size retains its heat well.

For the modellers workshop at a very reasonable price of 32s. 6d. we can strongly recommend it as being a good instrument and certainly value for money.

Manufacturers: Antex Ltd.

Monogram Badman

Latest in the long, long line of Monogram " Funny Cars " comes the " Badman." Described by the manufacturers as a 1955 Chevy Street " Funny Car " and Dragstrip Gasser, this kit when completed is one of the most eye-catching models in the series we've seen. Our builder informs us that it went together in the usual Monogram manner, i.e., simply and neatly, and presented very few problems. Fitting the blower fan belt was rather a vague operation apparently, but apart from this no other difficulties were encountered, although the instructions were rather misleading in places.

The finished model does, however, look excellent, and is without doubt " Monogram " in its assembly and appearance.

Manufacturer: Monogram Models Inc.



Above. The Monogram Badman.
Right. Undersea Adventure game from Spears.
Below. The new B.B.C. record releases.

B.B.C. Records

Newly released from the B.B.C. are three Long Playing Mono records entitled, Powered Flight, The End of Steam, and Narrow Boats.

Lack of space prevents us from going into details and describing the tremendously wide variety of sounds and interviews on the records, so the following descriptions are only a very rough guide as to the contents.

" Powered Flight " contains a variety of selected interviews with famous pioneers of Aviation, including such names as Lord Brabazon of Tara, Sir Thomas Sopwith, Sir Geoffrey de Havilland, and many others. Listening to the interviews and the hair-raising exploits of early flyers, makes the listener aware of the bravery and determination of those concerned with the development of early flight, although there were many amusing incidents too !

Also included on the track are recordings of famous aircraft such as the Spitfire, Tiger Moth and S.E.5a.

This record is aimed mainly at the enthusiast, although to someone with little knowledge of aircraft it can provide interest. After all, it is part of our history ! Price 37s. 6d.

" The End of Steam " follows a basically similar pattern to " Powered Flight," only this time of course the subject is railways.



Interviews play a smaller part on this record, the emphasis being on recordings of various locomotives, many of them famous, and all of them alas no longer running. Once again this is a record mostly for the enthusiast, but could be put to good use as authentic backing to a model railway. Price 37s. 6d.

The final record is " Narrow Boats " and of the three possibly has the widest appeal.

Although there are interviews with the men and women for whom this is a way of life, there are also many tracks devoted to the songs that have been handed down from generation to generation, which make this particular record more generally acceptable than perhaps the other two. Price 37s. 6d.

The above records are available from: The British Broadcasting Corporation, Villiers House, Haven Green, London W.5.



Undersea adventure game by Spears

For most of us, the weird and wonderful world beneath the surface of the sea, is still a great mystery. Most of the knowledge we have of the undersea world was probably obtained from seeing films or reading books, often produced or written by Hans Hass, the famous underwater explorer. Well, now you can learn about this amazing world, and at the same time have fun with this unusual Undersea Adventure Game devised by Hans and Lotte Hass.

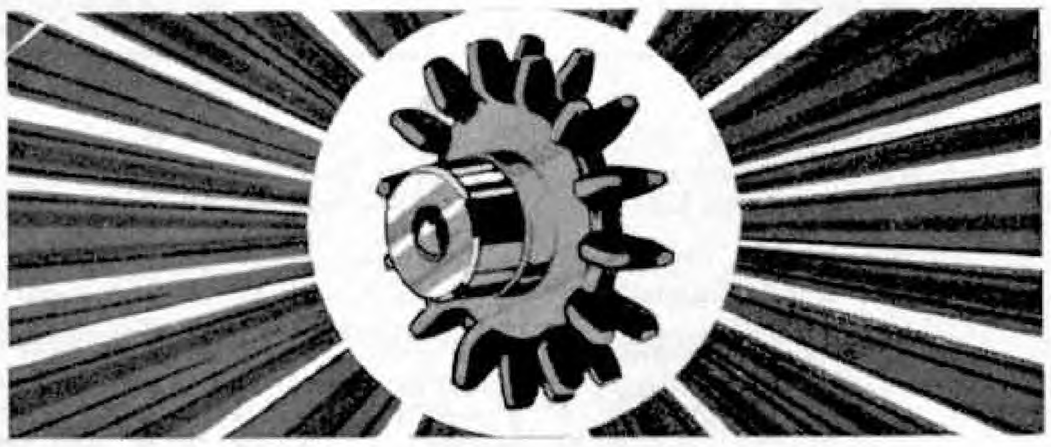
The object of the game is to obtain prizes, such as unusual sea animals, sunken treasure, or parts of ship wrecks, and then return to your ship, without being robbed of your possessions.

The game, produced by Spear's Games (our sample was kindly sent to us by " Wildlife ") contains a playing board, 4 sets of cards (of which many are illustrated with fine photographs by Hans Hass), 6 divers and a dice. We think it is rather complicated for the youngster, although, Mum and Dad will probably help out, but once you get used to it, the game becomes really good fun. The Undersea Adventure Game costs around 30s. and can be obtained from most toy shops.

Manufacturer: J. W. Spear & Sons Ltd.

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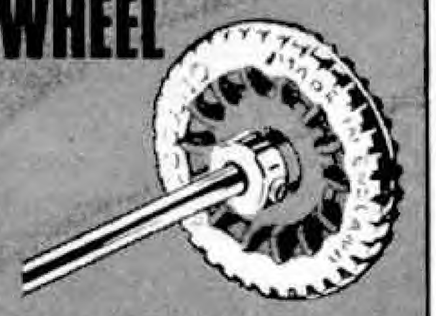


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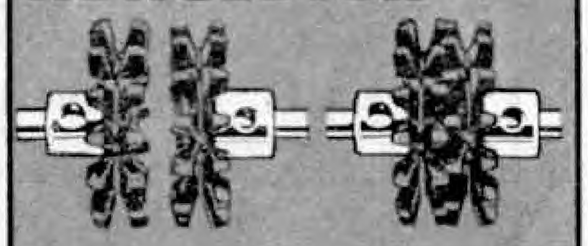
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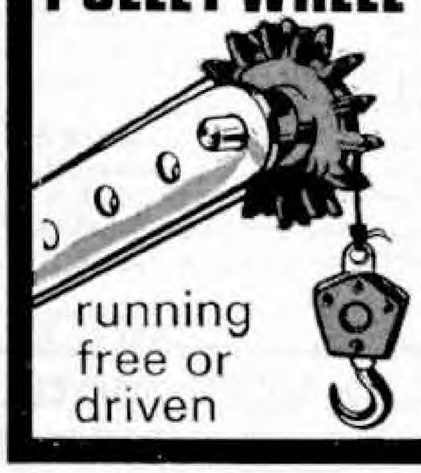
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AS A CLUTCH



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AS A PULLEY WHEEL



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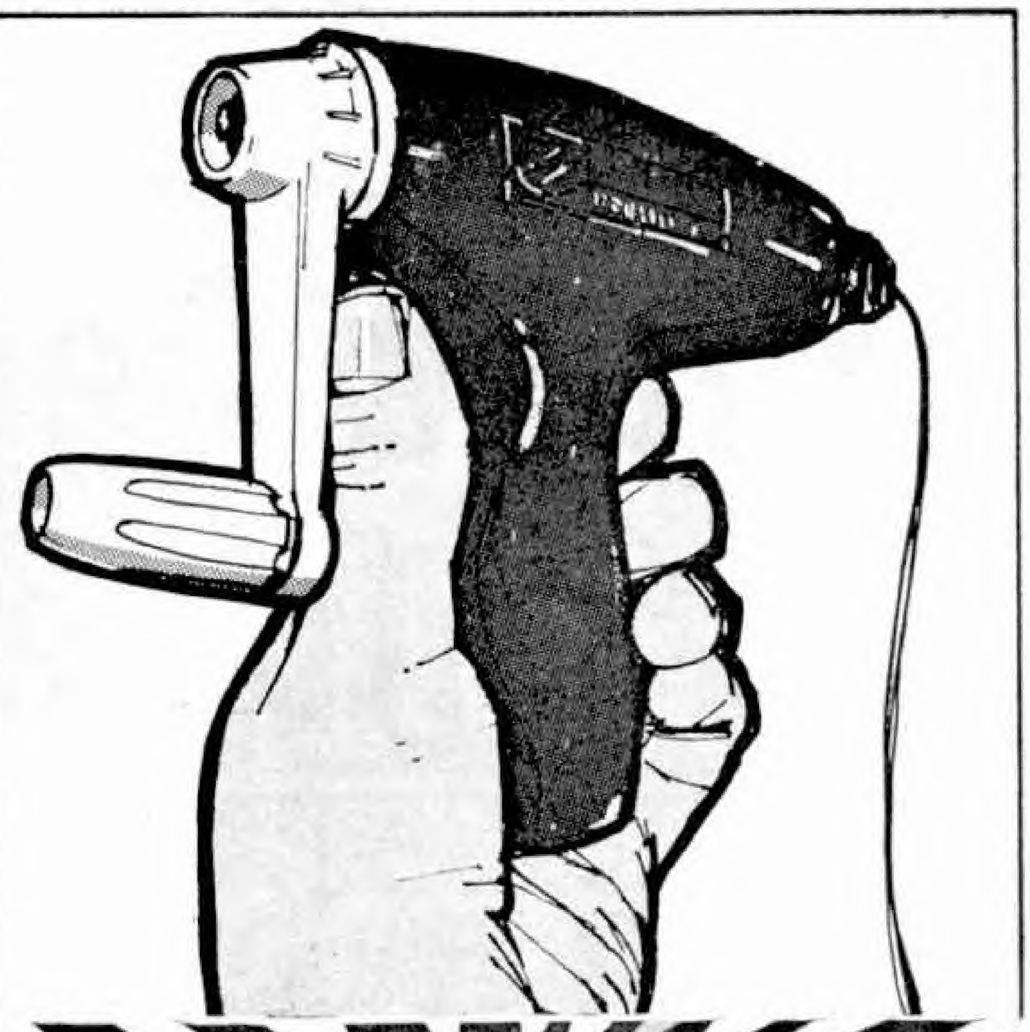
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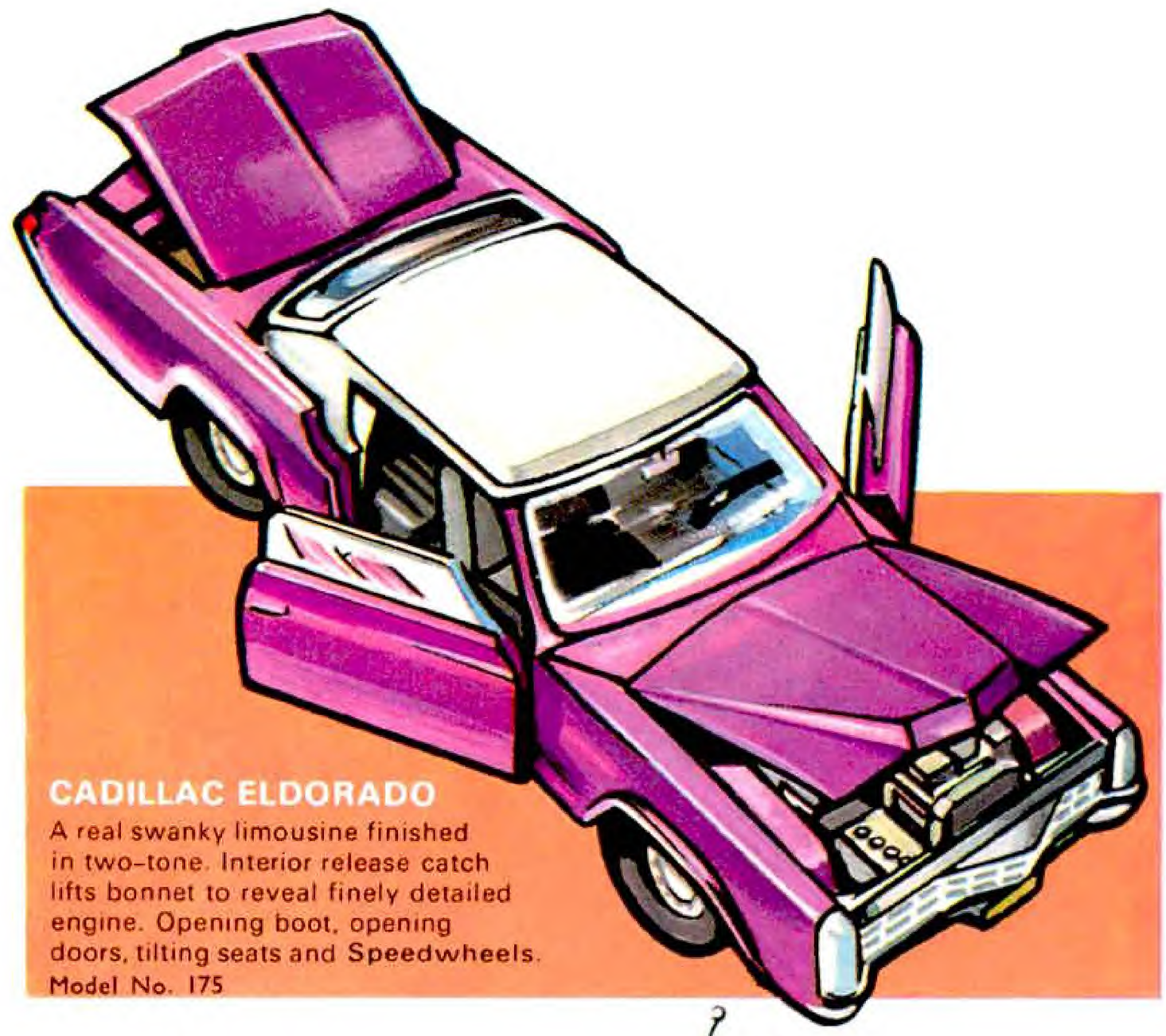
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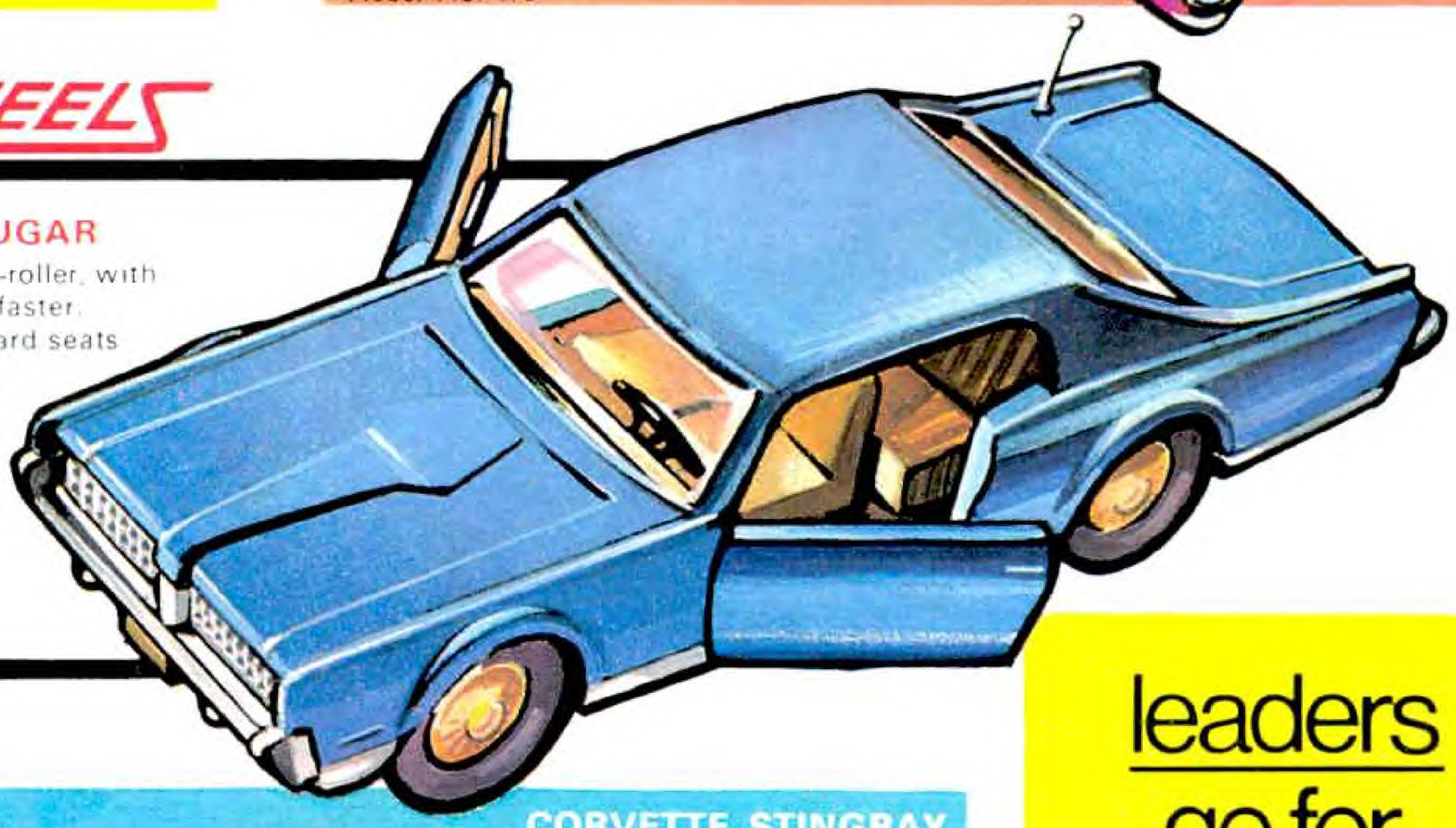
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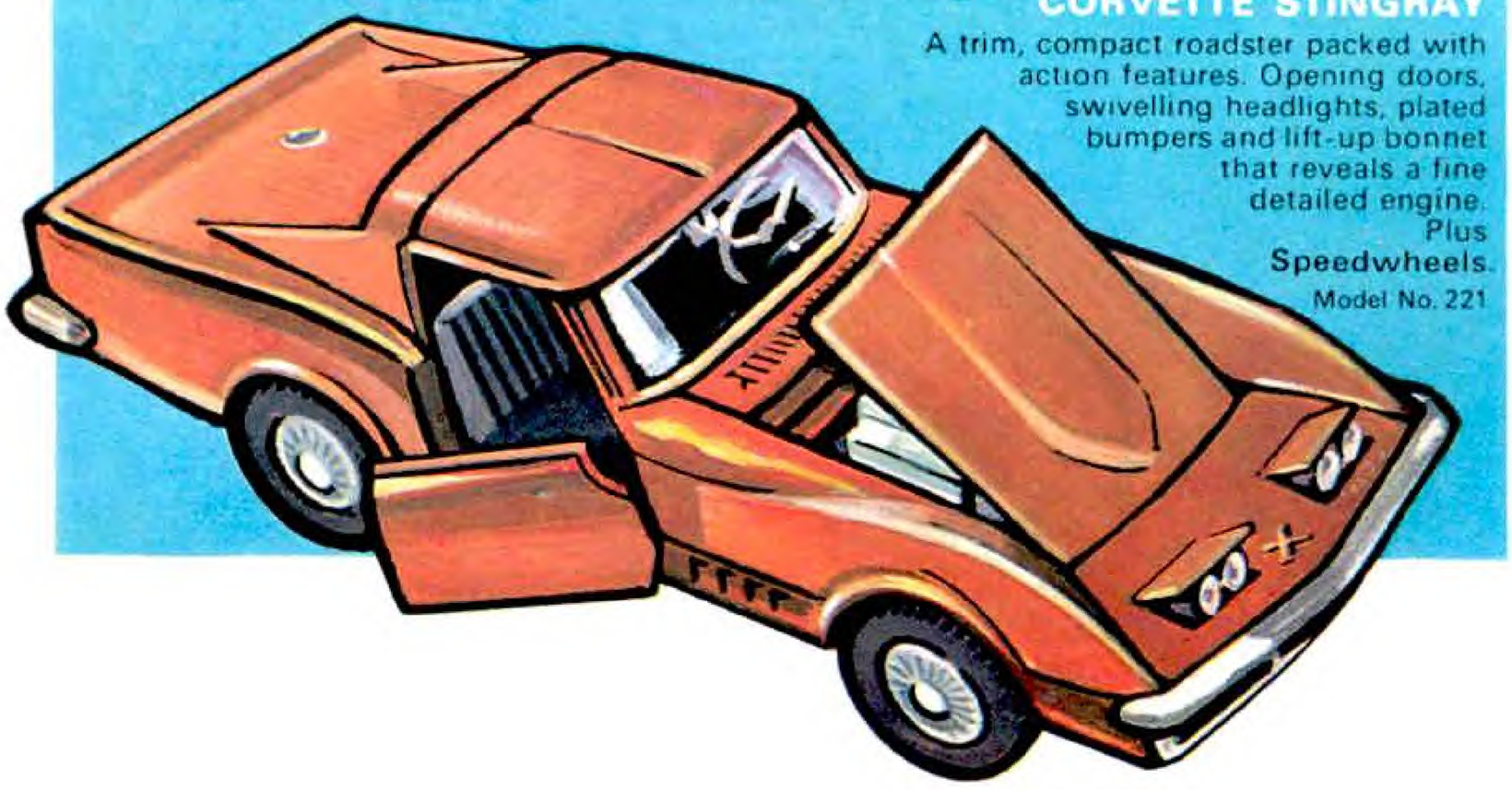


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